Final Design Concept Report

I-40, Rattlesnake Wash Traffic Interchange
Kingman - Ash Fork Highway

Arizona Department of Transportation

ADOT Contract No. 06-10
Federal No. STP-040-B(ASL)
Project No. 040 MO 57 H6814 01L

Prepared By:

URS Corporation
In association with EcoPlan Associates, Inc.

October 2007

ARIZONA DEPARTMENT OF TRANSPORTATION

OFFICE MEMO

INTERMODAL TRANSPORTATION DIVISION

August 6, 2007

TO: MICHAEL KONDELIS, KINGMAN DISTRICT, K600
GEORGE WALLACE, PROJECT MANAGER, F500
MARY VIPARINA, ASSISTANT STATE ENGINEER, 611E

FROM: PAUL O'BRIEN, ROADWAY PREDESIGN, 605E

SUBJECT: DESIGN MEMORANDUM
40 MO 56.00 H681401L
RATTLESNAKE WASH TI
KINGMAN-ASH FORK HWY
I 40

This memorandum is prepared pursuant to Section 3.3 of the ADOT Action Plan for Federal-Aid Highway projects. The proposed major design features for this project are described in the attached Final Design Concept Report.

Your concurrence/approval on the proposed major design features is requested.

for PAUL O'BRIEN, ROADWAY PREDESIGN MANAGER SECTION C, 605E

Concurrence: M Kondelis — 8-8-07
MICHAEL KONDELIS, KINGMAN DISTRICT, K600 — Date

Concurrence: George Wallace — Aug 13, 2007
GEORGE WALLACE, PROJECT MANAGER, F500 — Date

Approved: Mary Viparina — 10/18/07
MARY VIPARINA, ASSISTANT STATE ENGINEER-ROADWAY, 611E — Date

cc: Environmental & Enhancement Group, 619E
Roadway Design, 615E

Project id: 12495

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I-40, RATTLESNAKE WASH TRAFFIC INTERCHANGE
KINGMAN – ASH FORK HIGHWAY
I-40
KINGMAN DISTRICT – MOHAVE COUNTY

FINAL DESIGN CONCEPT REPORT

OCTOBER 2007

Prepared for:

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY ENGINEERING GROUP
ROADWAY PREDESIGN SECTION

Prepared by:

URS CORPORATION

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EXECUTIVE SUMMARY

This Design Concept Report (DCR) presents the results of the study for the Rattlesnake Wash Traffic Interchange (TI), Project No. 040 MO 57 H6814 01L. This project will construct a new traffic interchange (TI) on Interstate 40 (I-40) at Milepost (MP) 56.6, approximately 3 miles east of the existing I-40/State Route 66 (East Kingman) TI. The project also includes the construction of a new arterial street along the proposed Mohave Drive alignment between Louise Avenue on the south and Industrial Boulevard near the Kingman Airport on the north. A total of approximately 3.7 miles of new roadway will be constructed.

The City of Kingman (COK) has been experiencing a high level of population growth in recent years and expects this growth to continue into the future. Much of this growth is occurring on the east side of town, south of the airport and north of I-40 in the expanding new industrial park, and new retail and residential units.

The expanding industrial park near the airport will serve as a major employment center, and new residential units are also proposed south of the industrial park. However, physical barriers (I-40 and the Burlington Northern Santa Fe [BNSF] railroad tracks) separate the new development from the COK and inhibit access to these proposed sites. Currently, the only access to this project area is provided by the Hualapai Mountain Road bridge over the BNSF tracks, the new underpass crossing of the BNSF tracks at Airway Avenue, and the underpass crossing of the BNSF tracks at Mohave Airport Drive. Because of the inhibited mobility to the proposed development areas, a new arterial roadway (Mohave Drive) connecting to I-40 with a new TI is proposed.

The purpose of the I-40 Rattlesnake Wash TI Design Concept and Environmental Study is to investigate concepts to provide a new traffic interchange and arterial street connections to provide improved access to the East Kingman area.

COK and the Arizona Department of Transportation (ADOT) have entered into a Letter of Intent (LOI) that includes performing design concept and environmental studies, final design, and construction of a new TI on I-40 with new arterial street connections along the Mohave Drive alignment between Hualapai Mountain Road on the south and Industrial Boulevard near the Kingman Airport on the north. A copy of the LOI is contained in **Appendix F**. This proposed network would improve mobility within the entire City of Kingman.

The LOI consists of two phases. Phase 1 consists of a full access TI west of Rattlesnake Wash and the Mohave Drive arterial connection to Louise Avenue on the south with connections to both Airway Avenue and Industrial Boulevard to the north. For Phase 1, ADOT has committed funding for the scoping documents and for the design. ADOT and COK have agreed to share the construction costs for Phase 1 of this project at a 70 percent (ADOT) / 30 percent (COK) ratio. COK is responsible for all of the right-of-way acquisition. Phase 2 only includes a planning level feasibility corridor study and National Environmental Policy Act (NEPA) approval, to which ADOT has committed. The Phase 2 improvements for Mohave Drive are to be constructed by the COK and are included in this DCR for informational purposes only in support of preparing the NEPA approval document that includes both Phase 1 and Phase 2.

A Joint Project Agreement (JPA) will need to be prepared during the final design phase of this project (Phase 1) between the COK and ADOT further refining the LOI stipulations and cost-sharing responsibilities. In addition, an Intergovernmental Agreement (IGA) will need to be developed between the COK and ADOT on the limits of ADOT ownership and maintenance within the access control limits.

Based on the evaluation of the alternatives considered, the following is a summary of the recommended alternative for this project (Phase 1) and for future Phase 2 improvements by the COK as shown in **Figure E1**.

Phase 1 would construct a new I-40 overpass TI at MP 56.6 with full access and arterial connections to Louise Avenue on the south side, and connections to both Airway Avenue and further north to Industrial Boulevard.

- The configuration of the new overpass traffic interchange will be a compact diamond interchange and will be comprised of standard one-lane entrance and exit ramps. Both entrance and exit ramps will be designed as parallel type ramps. The parallel portion of the west side entrance and exit ramps will be elongated and extended to the west halfway to the termini of the proposed Kingman Crossing east side entrance and exit ramps. This will effectively lay the groundwork for the auxiliary lanes between the Rattlesnake Wash TI and the proposed Kingman Crossing TI; this will allow for a seamless connection during construction of the proposed Kingman Crossing east side ramps. If the Kingman Crossing TI will not be constructed, the Rattlesnake Wash TI west side entrance and exit ramps should be constructed as standard parallel type ramps.
- The Mohave Drive cross road will be depressed under I-40 with I-40 remaining at grade. Mohave Drive between the ramp intersections will provide two through lanes and two left-turn lanes southbound, and three through lanes with one left-turn lane northbound.
- Mohave Drive between Louise Avenue and the TI ramps would be constructed to provide two through lanes in each direction. Between the TI ramps and Airway Avenue, three through lanes in each direction would be constructed. North of Airway Avenue to Industrial Boulevard, an interim two-lane road (one lane in each direction) with paved shoulders would be constructed. The Mohave Drive improvements will include curb and gutter and sidewalks between Louise Avenue and Airway Avenue to accommodate drainage and pedestrian traffic. The improvements will also include a 16-foot-wide raised median with concrete curb between Louise Avenue and Industrial Boulevard to aid in the control of access along Mohave Drive and to provide a greater separation between opposing traffic.
- The I-40 eastbound (EB) and westbound (WB) overpass structures will consist of two single-span cast-in-place and post-tensioned concrete box girder superstructures with a total span length of 186 feet. The structures will be constructed to provide for future outside widening for a third lane on I-40.

Phase 2 would construct a two-lane (one lane in each direction) arterial connection from Hualapai Mountain Road to Louise Avenue. The improvements will include paved shoulders and a 16-foot-wide raised median with concrete curb to aid in the control of access along Mohave Drive and to provide a greater separation between opposing traffic. The Phase 2 project would be designed and constructed by the COK in accordance with the stipulations in the LOI.

The estimated total construction cost for Phase 1 is $35,831,000 and for Phase 2 is $10,471,000 (2007 dollars). The final design costs for Phase 1 is estimated at $2,518,000 and for Phase 2 is estimated at $733,000. The design and construction for the Phase 2 project will be funded solely by the COK.

Design of the Rattlesnake Wash TI is programmed for $2,000,000 for FY2008 in the ADOT 2008-2012 5-Year Transportation Facilities Construction Program. The proposed Kingman Crossing TI is located 1.5 miles west of the Rattlesnake Wash TI and is currently under study by the COK.

For Phase 1, the recommended alternative will require acquisition of approximately 80.86 acres of new right-of-way, plus 3.93 acres for slope easements, and 1.27 acres for drainage easements from private lands. The 80.86 acres includes the 34.18 acres that will be dedicated from the landowner adjacent to the TI in accordance with the development agreement between the COK and the land owner. All new right-of-way for this project will be acquired by the COK in accordance with the LOI between COK and ADOT.

Five additional reports have been prepared as part of the project, which include the Scoping Report, Traffic Report, Preliminary Drainage Report, Change of Access Report (COAR), and the Categorical Exclusion (CE) environmental document. The CE document was approved by the Federal Highway Administration (FHWA) on September 11, 2007. FHWA has determined the COAR is acceptable from an engineering and operational standpoint. A copy of FHWA's Determination of Engineering and Operational Acceptability letter dated July 20, 2007 is included in Appendix H. A copy of ADOT's letter to FHWA dated October 1, 2007 that summarizes the agreement between ADOT and FHWA for the change of access request for the Rattlesnake Wash TI is included in Appendix H.

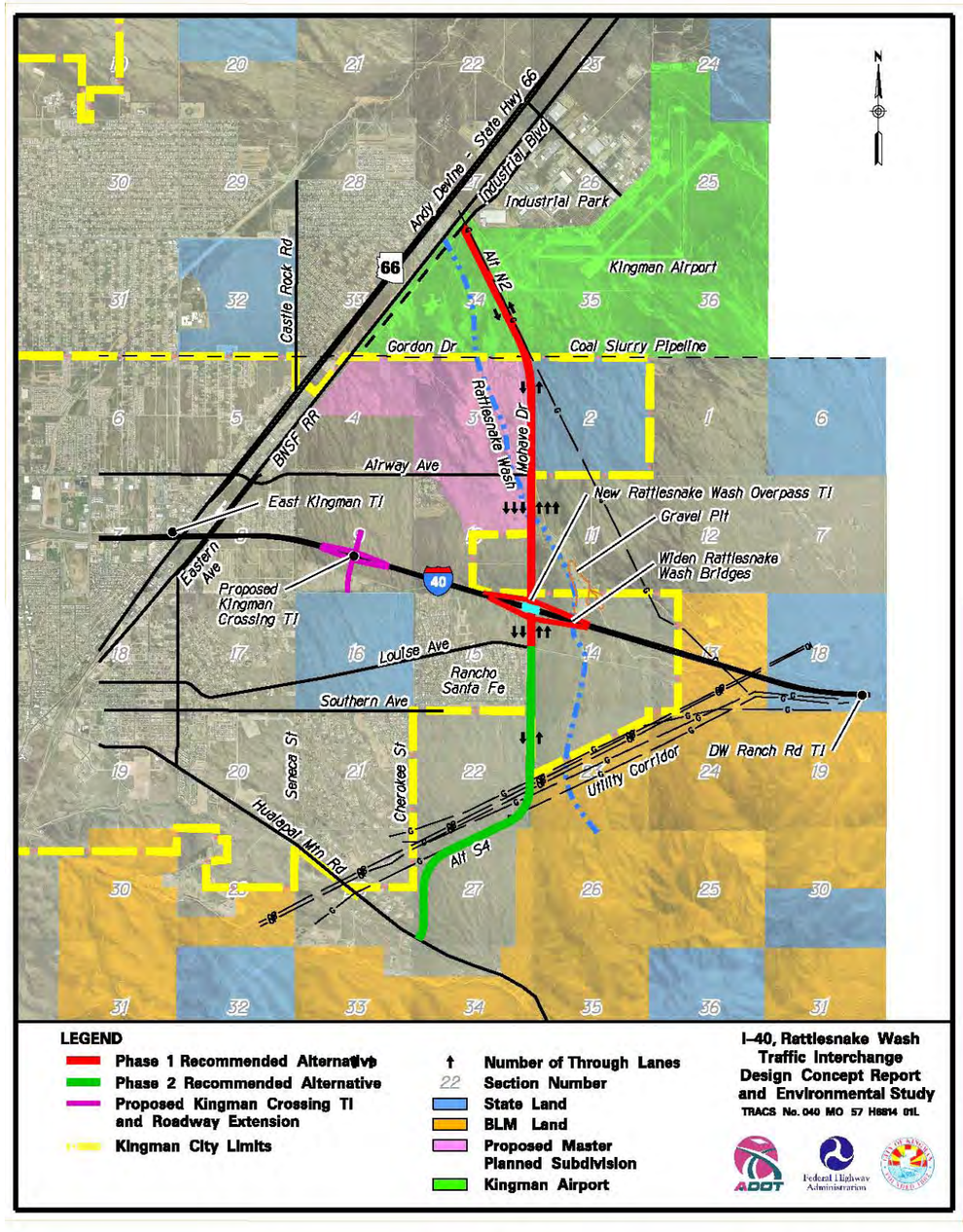


Figure E1 Recommended Alternative

SUMMARY OF MITIGATION MEASURES

Mitigation measures were presented in the Categorical Exclusion and are listed here in their final version. These mitigation measures will be implemented by the Arizona Department of Transportation by incorporating them into the project construction documents. The following mitigation measures and commitments are not subject to modification without the prior written approval of the Federal Highway Administration.

Arizona Department of Transportation Design Responsibilities

1. All disturbed soils that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.

2. Protected native plants within the project limits will be impacted by this project; therefore, the Arizona Department of Transportation Roadside Development Section will notify the Arizona Department of Agriculture at least 60 days prior to the start of construction so that the Arizona Department of Agriculture can determine the disposition of these plants.

3. During Phase IV of the final design, the Arizona Department of Transportation project manager will contact the Arizona Department of Transportation Environmental Planning Group hazardous materials coordinator (602.712.7767) to determine the need for additional site assessment.

4. During final design, a non-intrusive, subsurface electronic survey will be conducted along the northernmost mile of the Mohave Drive right-of-way. If the existence of shallow trenches is confirmed, the area will be excavated, refuse will be disposed of, and any hazardous material concerns will be identified.

5. The Arizona Department of Transportation Roadside Development Section will determine who will prepare the Storm Water Pollution Prevention Plan.

6. Noise mitigation on Mohave Drive will be assessed during final design.

Arizona Department of Transportation Kingman District Responsibilities

1. The District Construction Office will submit the Arizona Pollutant Discharge Elimination System Notice of Intent and the Notice of Termination to the Arizona Department of Environmental Quality.

Contractor's Responsibilities

1. To prevent the introduction of invasive species seeds, all construction equipment shall be washed at the contractor's storage facility prior to entering the construction site.

2. To prevent invasive species seeds from leaving the site, the contractor shall inspect all construction equipment and remove all attached plant/vegetation debris prior to leaving the construction site.

3. All disturbed soils that will not be landscaped or otherwise permanently stabilized by construction shall be seeded using species native to the project vicinity.

4. The contractor shall file a National Emission Standard for Hazardous Air Pollutants notification with the Arizona Department of Environmental Quality and the Arizona Department of Occupational Safety and Health at least 10 working days prior to the modification, demolition, or removal of regulated amounts of Asbestos Containing Material associated with construction on the bridge structures at Rattlesnake Wash.

5. The contractor shall submit the Arizona Pollutant Discharge Elimination System Notice of Intent and the Notice of Termination to the Arizona Department of Environmental Quality.

1.0 INTRODUCTION

1.1 FOREWORD

The Rattlesnake Wash traffic interchange (TI) Design Concept Study and environmental study is part of a collaborative project between the Arizona Department of Transportation (ADOT), Federal Highway Administration (FHWA), Bureau of Land Management (BLM), and the City of Kingman (COK) to identify alternatives that will improve access to East Kingman. Ultimately, the project would provide a new Interstate 40 (I-40) TI with an overpass near Rattlesnake Wash, as well as arterial street connections to Hualapai Mountain Road, Louise Avenue, Airway Avenue, and the Airport Industrial Park.

1.2 NEED FOR PROJECT

COK is an important regional center for northwestern Arizona and is a major hub of transportation, commerce, and government administration. COK is presently experiencing a surge in residential development with the largest concentration of growth occurring on the east side of the COK. The area is physically separated from the rest of COK by both I-40 and the Burlington Northern Santa Fe (BNSF) railroad tracks. The only way to access this area is provided by the Hualapai Mountain Road bridge over the railroad tracks and the new underpass crossing of the BNSF tracks at Airway Avenue. In order to improve access to this area, a variety of roadway improvements are proposed in the recently completed Kingman Area Transportation Study (KATS). The I-40 Rattlesnake Wash TI is part of the recommended plan along with an arterial street linking the east side of COK with the airport, I-40, and Hualapai Mountain Road.

1.3 PURPOSE AND SCOPE OF THE PROJECT

The COK and ADOT have signed a Letter of Intent (LOI) that includes performing design concept and environmental studies, final design, and construction funds to construct a new interchange on I-40 west of Rattlesnake Wash, along the Mohave Drive Section Line alignment, with arterial street connections to Hualapai Mountain Road, Airway Avenue, and the Airport Industrial Park. **Figure 1-1** shows the project study limits. The LOI consists of two phases:

- **Phase 1** includes a new I-40 overpass structure with full access and arterial connections to Louise Avenue on the south, and connections to both Airway Avenue and further north to Industrial Boulevard. ADOT has committed funding for the scoping documents and for the design. ADOT and COK have agreed to share the construction costs of this project at a 70 percent (ADOT) / 30 percent (COK) ratio. COK is responsible for the right-of-way acquisition. The arterial connection between Louise Avenue and Airway Avenue will be constructed to ultimate lane configuration. The arterial street connection north of Airway Avenue to Industrial Boulevard will be constructed to a two-lane (one lane in each direction) interim roadway. This connection may be widened by the COK in the future as traffic volumes warrant.
- **Phase 2** includes an arterial connection from Hualapai Mountain Road to Louise Avenue. ADOT has committed to performing a planning level feasibility corridor study and environmental National Environmental Policy Act (NEPA) approval as part of this project. The COK will then complete the design for the arterial connection from Hualapai Mountain Road to Louise Avenue and is solely

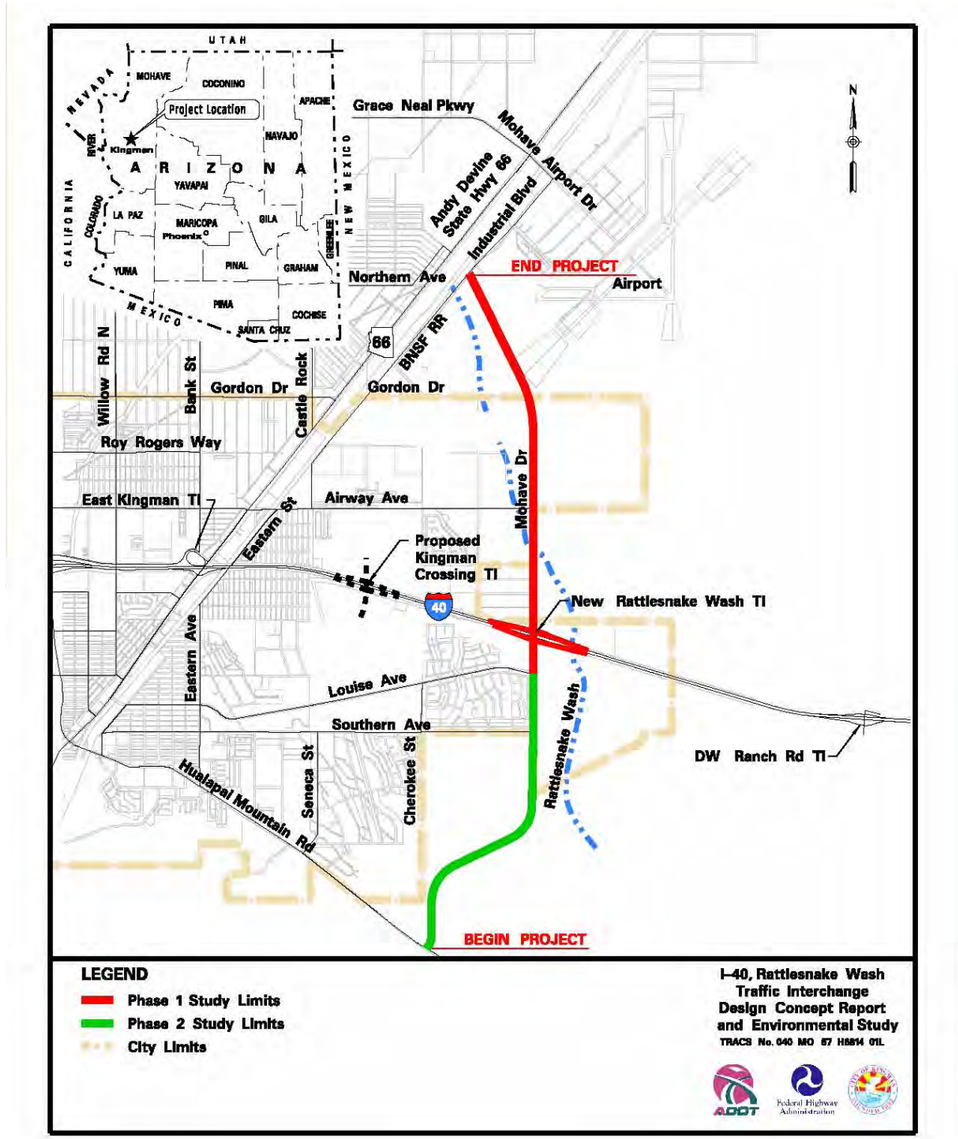


Figure 1-1 Study Location and Vicinity Map

responsible for design, construction, and right-of-way cost. COK has also agreed to start construction of the connection from Hualapai Mountain Road to Louise Avenue when traffic warrants, but no later than July 1, 2015, as per the LOI.

The Phase 2 improvements for Mohave Drive are to be constructed by others and are included in this DCR for informational purposes only in support of preparing the environmental NEPA approval document that includes both Phase 1 and Phase 2.

The purpose of the I-40 Rattlesnake Wash TI Design Concept and Environmental Study is to investigate concepts to provide a new traffic interchange and arterial street connections to provide improved access to the East Kingman area. Specific major goals for this project are:

- Perform design concept and environmental studies for Phase 1 improvements, which will include a new I-40 TI structure with full access and arterial connections to Louise Avenue on the south side, and connections to Airway Avenue and north to the airport industrial area.
- Perform a planning level feasibility study and environmental studies for Phase 2 improvements for the arterial connection from Hualapai Mountain Road to Louise Avenue.
- Improve access to the rapidly growing East Kingman area.
- Identify and work with affected jurisdictions and agencies to build and obtain consensus.
- Identify and evaluate any requirements for Joint Project Agreements (JPAs) between ADOT and local jurisdictions prior to final design.

1.4 DESCRIPTION OF PROJECT (PHASE 1 RECOMMENDED ALTERNATIVE)

The recommended alternative will construct a new compact diamond overpass TI with full access and arterial connections to Louise Avenue on the south side, and connections to both Airway Avenue and farther north to Industrial Boulevard. The Mohave Drive cross road will be depressed under I-40 with I-40 remaining at grade. This alternative is described in further detail below.

1.4.1 Project Limits

The study area is located on the east side of the City of Kingman, east of State Highway 66 (Andy Devine Avenue) and south of the airport as shown on **Figure 1-1**. The Project limits on I-40 will extend from MP 55.5 (Station 2902+00) to MP 57.3 (Station 2995+00), and the limits for Mohave drive will extend 3.7 miles from Louise Avenue to Industrial Boulevard.

1.4.2 Proposed Pavement Width

Table 1-1 Proposed Pavement Width

Roadway Section	Pavement Width
I-40 Mainline	38' Each Direction (Existing)
I-40/Rattelsnake Wash TI Ramps	28'
Mohave Drive – Louise to I-40	81' (includes 16' median)
Mohave Drive – At I-40 within Interchange	119' (includes 6' median)
Mohave Drive – I-40 to Airway Avenue	105' (includes 16' median)
Mohave Drive – Airway Avenue to Industrial Boulevard	60' (includes 16' median)

1.4.3 Total Number of Proposed Lanes

Table 1-2 Total Number of Proposed Lanes

Roadway Section	Pavement Width
I-40 Mainline	2 Lanes in Each Direction (Existing)
I-40/Rattelsnake Wash TI Ramps	1 lane
Mohave Drive – Louise to I-40	4 Lanes
Mohave Drive – At I-40 within Interchange	5 Lanes (2 SB lanes, 3 NB lanes)
Mohave Drive – I-40 to Airway Avenue	6 Lanes
Mohave Drive – Airway Avenue to Industrial Boulevard	2 Lanes

1.4.4 New Right-of-Way

Approximately 80.86 acres of new right-of-way, plus 3.93 acres for slope easements, and 1.27 acres for drainage easements from private lands will need to be acquired. The 80.86 acres includes the 34.18 acres that will be dedicated from the landowner adjacent to the TI in accordance with the development agreement between the COK and the land owner. All new right-of-way for this project will be acquired by the COK in accordance with the LOI between COK and ADOT.

1.4.5 Access Control

Access control along Mohave Drive will be required; it is recommended that full access control be extended to Louise Avenue on the south and to the Grand Canyon Road alignment on the north. On the south side of the TI, the access control distance from the south ramp radius return to Louise Avenue would be approximately 1,350 feet. On the north side, the access control distance from the north ramp radius return to Grand Canyon Road would be approximately 1,600 feet. The ADOT access control limits would extend 300 feet from the ramp radius returns. Beyond this point, access control will need to be obtained, implemented, and preserved by the COK with a written agreement and/or through the local agency permitting process.

1.4.6 Curb, Gutter, Sidewalks, and Medians

No curb and gutter will be required on I-40 or the ramps. New ADOT Type D (C-5.10) curb and gutter will be used along the on the outside edge on Mohave Drive, and new ADOT Type G (C-5.10) curb will be used for the median curb on Mohave Drive. The Mohave Drive improvements will include a 16-foot-wide raised median with concrete curb between Louise Avenue and Industrial Boulevard to aid in the control of access along Mohave Drive and to provide a greater separation between opposing traffic.

1.4.7 Striping, Marking, and Signing

Striping, marking and signing will be in accordance with the 2003 *Manual on Uniform Traffic Control Devices* (MUTCD), the Arizona Supplement to the 2003 MUTCD and the latest ADOT Traffic Engineering Policies, Guides, and Procedures Manual.

1.4.8 Drainage Improvements

Preliminary offsite and onsite drainage systems have been developed for the recommended alternative and described below:

I-40 TI Drainage Offsite Design

Nine culvert crossings along I-40 located to the west of the new TI at Stations 2905+05, 2910+05, 2915+00, 2923+57, 2928+752934+00, 2938+36, 2943+50, and 2947+00 will be extended to accommodate the roadway widening of I-40 and the new west side ramps.

The new TI will have the crossroad depressed under I-40 for which the depressed ramps will cut off four culvert crossings requiring the flows to be diverted into a new storm drain system to be conveyed under I-40 and then north along Mohave Drive. The four culvert crossings that will be cut off by the new ramps are:

- Station 2953+00 – Flow to be diverted into new 60-inch storm drain lateral.
- Stations 2960+50, 2964+64, and 2967+49 – Culvert inflows will be diverted into a 10-foot bottom width, 2:1 side slope, concrete lined channel. The channel will be constructed south and above the new cut slope for Ramp D. The channel will discharge into a drop inlet for a new 78-inch diameter storm drain lateral.
- The inflows from the new 60-inch and 78-inch laterals will be combined into a new 84-inch diameter storm drain that will also receive inflows from other minor laterals along Mohave Drive. The 84-inch storm drain will bend 45 degrees and discharge into an existing streambed at Station 219+13 Left on Mohave Drive.

The existing I-40 Rattlesnake Wash bridges will be extended on the outside to accommodate the widening of I-40 for the eastside ramps. During final design, the need for a cutoff wall in Rattlesnake Wash, downstream of the widened bridges, will need to be evaluated.

I-40 TI Onsite Drainage Design

The onsite runoff from the ramps and cut slopes will drain into roadside V-ditches. The V-ditch flows will be intercepted by C-15.90 median dike catch basins (area inlets) that will discharge into the main Mohave Drive storm drain. A network of minor laterals will be used along Mohave Drive under the interchange to pick up the flows from the various combination and area inlets.

Mohave Drive Drainage Design

Mohave Drive will be constructed for approximately 0.9 mile to the south of I-40. This portion will match existing grade near Louise Avenue. Roadside runoff from the cut slopes will drain northward alongside the roadway curb and gutter along Mohave Drive. Combination catch basins with slotted drain will be used to intercept the flow and then discharge it into the proposed storm drain.

Also to the south of the TI, crown ditches will be necessary to protect the cut slopes. The crown ditch above Ramp D is the aforementioned concrete channel. The crown ditch that protects Ramp C will discharge into the cross culvert at Station 2947+00. No crown ditches are needed for the northwest or northeast quadrant of the interchange.

Several culvert crossings, storm drain system, and roadside channels are needed along Mohave Drive, starting just north of the new TI. Generally, each culvert should be designed for the 100-year flow. Dumped riprap plunge basins will be used at the outlets of all new culvert crossings. New combination catch basins with slotted drain will be needed at various points along Mohave Drive. New catch basins will connect directly to new cross culverts where possible. Where required, collector storm drains will discharge into the next available downstream cross culvert.

1.4.9 Structures

The I-40 eastbound (EB) and westbound (WB) overpass structures will consist of two single-span cast-in-place and post-tensioned concrete box girder superstructures with a total span length of 186 feet. The structures will be constructed to provide for future outside widening for a third lane on I-40.

The EB and WB Rattlesnake Wash Bridges will be widened to the outside to accommodate the ramp approach for the WB off-ramp and the ramp departure for the EB on-ramp. In the westward direction near the exit gore, the widening of the EB Bridge will vary approximately 27-37 feet and the WB bridge widening will vary approximately 16-18 feet. Though the existing bridge railings (Type H-2-1) meet current standards based on the latest ADOT Bridge Inspection Report dated December 15, 2004, the inside bridge railing will also be replaced to match the new 32-inch F-Shape barrier on the widened section of the bridge. The rail bank protection and the concrete scour slab will also be extended as needed to accommodate the widening of each bridge.

1.4.10 Utilities

The following utility companies have utilities within the project limits: Black Mesa Pipe Line, Citizens Communication, City of Kingman, and Unisource Energy. No utility conflict are anticipated except that the Citizens Communication T1 carrier line located along the north I-40 right-of-way line will need to be relocated to the outside and along the new north I-40 right-of-way line within a new utility easement.

1.4.11 Traffic Control

It will be necessary to maintain traffic on I-40 during construction of the grade separation structures for the proposed traffic interchange. Given that the new EB and WB I-40 overpasses will be constructed at grade on the existing alignments, temporary detours will be required during construction. The ramps will be used to detour traffic through the construction zone to maintain two lanes of traffic in each direction. The entrance ramps would be designed as two-lane ramps to the gore areas with temporary striping to tie into I-40 traffic lanes. The exit ramps would be designed as single-lane ramps with wider shoulders to accommodate two lanes of detour traffic. Temporary pavement will be needed through the ramp intersections with Mohave Drive to provide a smooth transition across the intersection.

Using the ramps as detours will require a temporary drainage system to drain the depressed ramp detours during construction. The south ramp detour will cut off drainage flows from four culverts. Prior to constructing the ramp detours and the I-40 overpass structures, the new 84-inch storm drain pipe will need to be jacked and bored under I-40 and constructed to Rattlesnake Wash so that the depressed ramp detours can be drained to prevent the depressed section from flooding. If the geotechnical analysis determines that jacking an 84-inch pipe under I-40 is not feasible, an alternative method to keep the depressed ramp detours from flooding will need to be developed, or using median crossover detours will need to be used.

1.5 PROJECT OBJECTIVES

The primary objective of this study is to investigate alternatives for constructing a new TI on I-40 to provide access to and accommodate traffic volumes generated by the rapidly growing East Kingman area. Each alternative will be described and evaluated in terms of engineering feasibility, traffic service benefits, potential sensitive environmental issues, and project costs. The intent of this study is to develop the concept of the project in detail, to define the design parameters for final design, and to provide direction and scale of improvement.

The project study team, in cooperation with participating government agencies, established a number of additional objectives at the outset of the study, together with a list of factors to be used in evaluating each of the design concept alternatives. The process involved input from the general public and the various agencies, as outlined below.

1.5.1 The Scoping Process

ADOT initiated the study by conducting a project kickoff and scoping meetings with the general public and participating government agencies. The purpose of these meetings was to obtain information from the area residents, business people, and the public agency representatives regarding the proposed TI and the arterial street connections so that the issues, concerns, and opportunities (ICOs) can be addressed in developing and evaluating alternatives in the DCR and environmental document. The meetings provided an opportunity for those in attendance to describe issues and express concerns about the proposed TI, as well as to suggest various improvements that could be considered during the study.

The project kickoff meeting was held on April 3, 2006, at 10:00 A.M., at the Kingman City Council Chambers in Kingman, Arizona. The agency scoping meeting was held on May 16, 2006, at 2:00 P.M., at the Kingman Police Department Training Room in Kingman, Arizona. Representatives from ADOT Kingman District, ADOT headquarters, FHWA, COK, Mohave County, Kingman Airport Authority, and BLM were invited to both meetings.

A public scoping meeting was held at the Kingman Police Department Training Room on May 16, 2006, at 5:30 P.M.

1.5.2 Issues, Concerns, and Opportunities

During the kickoff, agency, and public scoping meetings, the following ICOs were identified for further evaluation.

Engineering ICOs

URS Corporation (URS) updated the KATS model and street network for year 2030 based on the planned land use for Kingman Airport and the latest Kingman General Plan.

Some trucking companies have contracts with gas stations on Andy Devine and will, therefore, exit there even with the new Rattlesnake TI to access the Airport Industrial Park.

There is a new TI planned between the East Kingman TI and the proposed Rattlesnake Wash TI. This Kingman Crossing TI is planned to be developer- and COK-funded. Both interchanges required a Change of Access Report (COAR).

Four TI types were identified for consideration for the Rattlesnake Wash TI. They were a compact diamond, spread diamond, single point urban (SPUI), and partial cloverleaf (PARCLO). These alternatives have been screened, and it was determined that the TI will be a compact diamond. Developers in the area south of the TI have set dedication limits based on a development agreement with COK. The dedicated right-of-way limits were based on a compact diamond TI configuration. The footprint of the new TI should remain within these limits.

The study also evaluated the crossroad being elevated over or depressed under I-40. Removing the skew from the crossing was evaluated.

The new TI will accommodate future widening of I-40 based on ADOT's MoveAZ 20-year long-range transportation plan to widen I-40 from two lanes to three lanes in each direction. Future widening will occur on the outside.

ADOT standards were utilized up to the ADOT access control limits and COK standards were used for the remaining portion of the roadway. The COK standards were verified to meet American Association for State Highway and Transportation Officials (AASHTO) standards in case the project receives Federal funding.

Alignment alternatives were developed for Phase 2 of the project, the connection from Hualapai Mountain Road to Louise Avenue. The COK general plan and the KATS show an alignment that curves to the south-west from Southern Avenue. Additional alternatives were developed that included curving the alignment to follow the utility corridor or staying on the section line and crossing the BLM land. The BLM verbally stated that they would consider this alternative, but the project will need to follow the NEPA process.

The structures analysis for the project included the overpass vs. underpass for the TI with potential structure types. The existing bridges over Rattlesnake Wash will require widening to accommodate the new ramps and tapers. Where the new Mohave Drive crosses Rattlesnake Wash, a new box culvert will be required.

As part of the LOI, the COK will acquire the right-of-way along Mohave Drive for Phase 1 of the project by 2008. COK has also had preliminary discussions (nothing formal yet) with the landowner of the proposed master planned subdivision about dedicating right-of-way along Mohave Drive.

Any new right-of-way for a new road across the Kingman Airport property will need to be approved by the Federal Aviation Administration (FAA). The FAA administers the World War II Surplus Property Act in this case as the Kingman Airport and Industrial Park had been developed as a military airfield in the 1940s. The property south of the existing improvements (runways, taxiways, and airfield improvements) was never fully released for development, meaning that the FAA still has the final approval of all improvements. The Airport Authority is pursuing a conditional release (new administrative guidelines) of the land to develop additional industrial sites within the area; however, that process requires a full Environmental Impact Analysis and could take two or more years. The FAA has completed an airspace determination study to release the airport property for the new Mohave Drive right-of-way from aeronautical use to non-aeronautical use.

Rattlesnake Wash crosses I-40 and flows from south to north. There is a gravel mining operation on Rattlesnake Wash, downstream of I-40. ADOT has placed a cut-off wall and paved the channel bottom under the existing bridges. Head cutting from the gravel operation could be a concern. The COK transmitted several past drainage studies to URS including the railroad diversion channel report. This report contains current data for Rattlesnake Wash based on ADOT methodology and stated the 100-year flow is 2,817 cubic feet per second (cfs), less than previous estimates. The existing I-40 bridges over the wash include a concrete floor and cutoff walls. The floor should be extended to accommodate the widening of I-40 for the new TI ramps. Rattlesnake Wash will cross Mohave Drive farther downstream from I-40, where a box culvert will be considered at this location.

Environmental ICOs

Initially it was assumed that the NEPA document will be an Environmental Assessment (EA) with FHWA as the lead agency with the NEPA study limits extending from Hualapai Mountain Road to the Industrial Boulevard for both Phase 1 and Phase 2. Subsequently, it was determined that a CE would suffice.

A purpose and need statement was developed with the KATS as background. Input from the agency and public scoping meetings was used to develop the evaluation criteria.

Several studies were prepared to support the environmental document. They include biological, cultural, hazardous materials, air, and noise. There are no Clean Water Act issues with this project because all of the run-off discharges into Red Lake which has no outfall to waters of the United States. A 404 permit is not required since runoff drains into a closed basin that is not a tributary to the Colorado River.

There was some concern about future noise levels along Mohave Drive from the residents in the Rancho Santa Fe subdivision.

1.5.3 Evaluation Criteria

The following criteria were used to evaluate the potential impacts of the TI and connector road alternatives:

- Construction Costs
- Roadway Geometry and Safety
- Traffic Operational Impacts
- Right-of-way Acquisition
- Earthwork
- Drainage
- Structures
- Construction Impacts to I-40
- Utilities
- Environmental Considerations

1.6 CHARACTERISTICS OF THE CORRIDOR

The posted speed limit on I-40 in the vicinity of the proposed interchange is 75 miles per hour (mph). The nearest adjacent interchanges on I-40 are located at Andy Devine Avenue, approximately 3 miles west and at DW Ranch Road, approximately 3 miles east. There are no existing frontage roads in this area.

There are no existing improved roadways along the Mohave Drive section line.

1.6.1 Roadway Characteristics

Within the study limits, I-40 is a four-lane divided highway on level terrain consisting of two 12-foot lanes in each direction, a 4-foot inside shoulder, and a 10-foot outside shoulder. An 84-foot median separates the EB and WB lanes. The EB and WB roadways have a normal cross slope of 0.015 ft/ft. The horizontal alignment of I-40 within the project limits is on tangent. The profile grade is approximately 1 percent upgrade from west to east. Existing I-40 pavement consists of AC for all lanes and shoulders in both directions.

Mohave Drive is not currently an improved roadway.

The average elevation of the study area is approximately 3,510 feet. The terrain is gently sloping and rising to the south.

The original and successor construction projects for I-40 which have occurred within the project limits are shown in **Table 1-3**.

Table 1-3 Original and Successor Construction Projects

Project No.	As-Built Date	Scope of Work
I-40-2(36)	1970	Grade and drain
I-40-2(77)	1979	Sign rehabilitation
I-40-2-907	1974	Scour protection
FRI-I-40-2(89)	1984	Safety improvements
IM-40-2(116)	1997	Remove and replace ACFC

1.6.2 Land Use

Land within the project limits is primarily privately owned, undeveloped, and rural in nature as shown in **Figure 1-2**. At the south end of the project, in the southwest quadrant of the Mohave Drive alignment and Louise Avenue, Rancho Santa Fe exists as a residential development. A large proposed master planned subdivision, Celebrate Homes, borders the west side of the Mohave Drive alignment from ½ mile south of Airway Avenue to Gordon Drive. State Trust lands are on the east side of the alignment, between Airway Avenue and Gordon Drive. North of Gordon Drive is land controlled by the Kingman Airport Authority including an industrial area northwest of the airport. South of Southern Avenue, the land is privately owned and/or BLM-managed land.

1.6.3 Right-of-Way

The existing right-of-way width along I-40 is 308 feet within the project limits.

There is some existing right-of-way along the Mohave Drive section line and is shown in **Figure 1-3**. In addition, there is a development agreement in place between the developers and the COK to dedicate right-of-way for the new TI.

1.6.4 Structures

The Arizona State Highway System Bridge Record identifies two structures within the corridor. Two 5-span continuous reinforced concrete slab bridges carry I-40 over Rattlesnake Wash at MP 56.9. See **Table 1-4** for additional information.

Table 1-4 Existing Bridges

Structure No.	MP	Structure Name	Bridge Type	Year Built	Length (feet)	Bridge Roadway Width (feet)	Sufficiency Rating
1173	56.90	Rattlesnake Wash EB	Concrete Continuous Slab	1967	163'-9¼"	40'-7"	97.34
1174	56.90	Rattlesnake Wash WB	Concrete Continuous Slab	1967	163'-9¼"	40'-7"	97.34

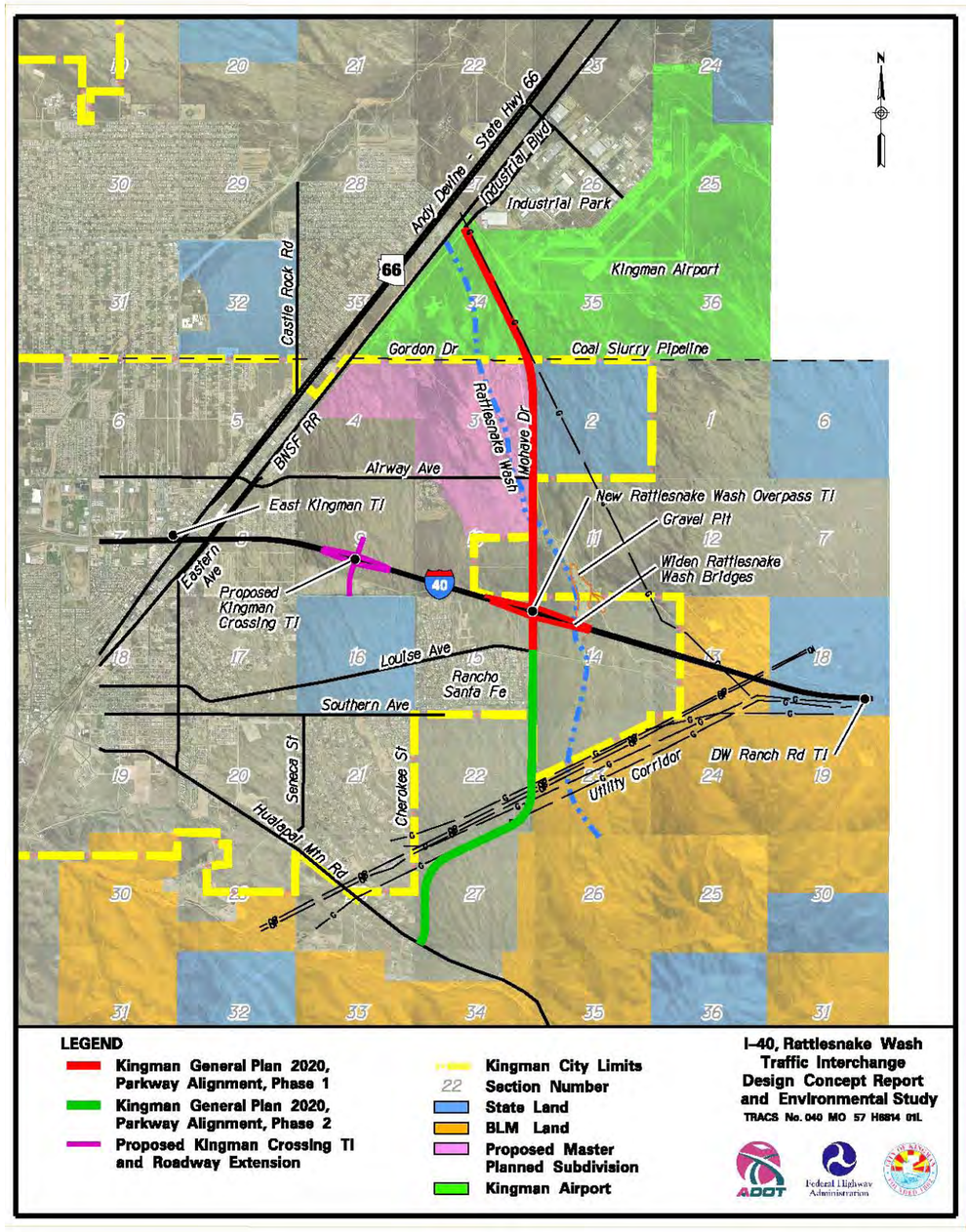


Figure 1-2 Project Overview

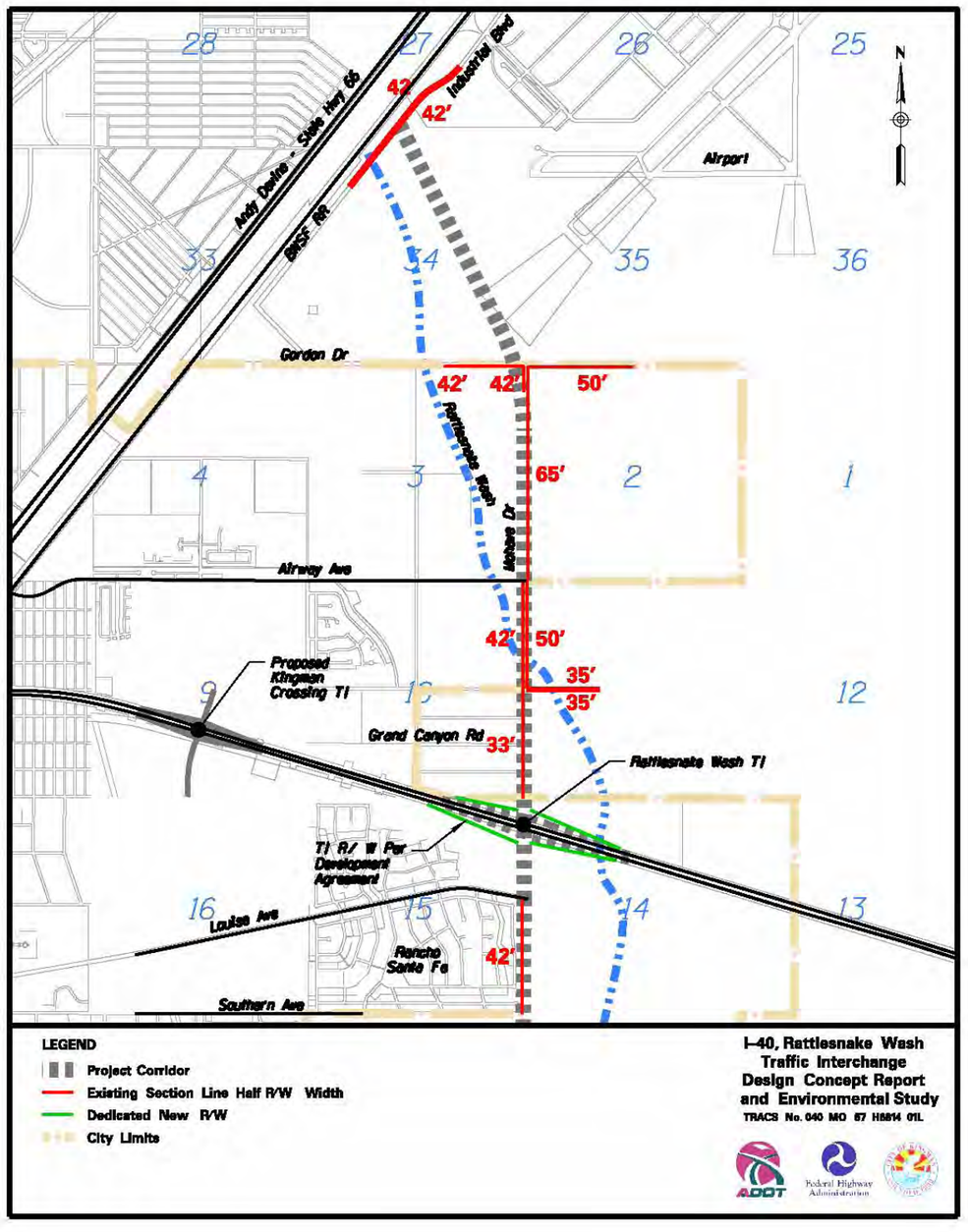


Figure 1-3 Right of Way Map

1.6.5 Utilities

There are several major existing utilities within the project limits. See **Table 1-5** for a list of the utilities and their locations.

Table 1-5 Existing Utilities

Utility Owner	Utility Type	Location
Black Mesa Pipeline	18" coal slurry pipeline (inactive)	Along the Gordon Drive section line
Citizens Communication	Fiber Optic Line	Along Airway Avenue and Louise Avenue
	TI carrier line	Within a 10-foot easement along the north I-40 right-of-way line
City of Kingman	12" water line	Extends west from a well site at the west side of the airport.
El Paso Natural Gas	24", 30" & 34" natural gas pipelines	Within the utility corridor south of I-40
Mohave Electric Cooperative	69 kV transmission line	Within the utility corridor south of I-40
Questar Pipeline	16" natural gas pipeline "Four Corners Line"	Within the utility corridor south of I-40
Transwestern Pipeline	30" natural gas pipeline	Within the utility corridor south of I-40
Unisource Energy (Gas)	6" natural gas pipeline	Diagonally crosses airport property through section 34 and continues in a southeast direction toward I-40
W.A.P.A.	2-230 kV transmission lines	Within the utility corridor south of I-40

Unisource Energy (electric) plans to build a new substation south of the airport in the SW ¼ of Section 1. A new 69 kV distribution line would extend south from the new substation to the mid-section line of Section 12 and turn to the west and extend to the east side of Section 9. This new line would cross the proposed alignment of Mohave Drive. Another 69 kV line would tee into the first line near the midpoint of Section 11 and travel south across I-40 to the large utility corridor. The line would then parallel the corridor to the southwest and extend to an existing substation near Hualapai Mountain Road.

The Black Mesa coal slurry pipeline is currently inactive. There are plans to relocate the line. The relocation would begin near DW Ranch Road and I-40. The new line would travel west along I-40 and then turn southwest and run along the large utility corridor. The new line is planned to be activated in 2009.

1.6.6 Existing Drainage Characteristics

The topography surrounding the project site slopes generally from south to north and rainfall runoff collects in several defined natural streambeds. There are nine existing cross-culverts under I-40 that will be impacted, consisting of four pipe culverts and five concrete box culverts. A five-span reinforced concrete bridge is used to cross Rattlesnake Wash, which is the largest streambed that crosses I-40 within the project limits.

There is an existing sand/gravel pit located approximately ¼-mile north of the Rattlesnake Wash I-40 bridge. The pit has strongly influenced the drainage along Rattlesnake Wash south of the interstate. Severe head cutting of the streambed is evident to within approximately 600 feet downstream (north) of the existing bridge. Rattlesnake Wash is one of four project streambeds that will cross the northern leg of the proposed Mohave Drive.

At the north end of the proposed Mohave Drive project limits, the City of Kingman Municipal Airport has an unlined trapezoidal channel along the southern perimeter. This airport interceptor channel (AIC) intercepts Rattlesnake Wash and three of the other streambeds that cross I-40. The AIC crosses Industrial Boulevard at an existing ford crossing and then crosses under the BNSF railroad through an existing nine-span steel-beam bridge.

2.0 TRAFFIC AND ACCIDENT ANALYSIS

2.1 TRAFFIC DATA

2.1.1 Existing Conditions

Interstate 40 is currently a rural divided highway with two lanes in each direction. The posted speed limit on I-40 in the vicinity of the proposed new interchanges (Kingman Crossing TI and Rattlesnake Wash TI) is 75 mph. Interchanges in the Kingman vicinity on I-40 are located at DW Ranch Road, Andy Devine Avenue (SR 66), Stockton Hill Road, and US 93. There are no existing frontage roads in this area and no improved roadways along the Mohave Drive section line.

Twenty-four-hour traffic volumes along I-40 from US 93 to DW Ranch Road and Andy Devine Avenue (SR 66) for the Years 2003 to 2005 are shown in **Table 2-1**. The Year 2005 average annual daily traffic (AADT) volume for I-40 from US 93 to DW Ranch Road ranged from 36,900 to 21,800 vehicles per day.

Table 2-1 I-40 and SR 66 Average Daily Traffic (Years 2003-2005)

Route	From	To	Length (miles)	AADT 2003	AADT 2004	AADT 2005
I-40	Exit 48, US 93 / SB40 / Beale Street	Exit 52, Stockton Hill Road	2.82	29,300	32,300	36,900
I-40	Exit 52, Stockton Hill Road	Exit 53, SR 66 / SB 40	1.39	23,700	24,400	24,900
I-40	Exit 53, SR 66 / SB 40	Exit 59, DW Ranch Road	6.57	19,900	20,000	21,800
SR 66	I-40 (Exit 53)	Industrial Parkway	4.48	17,000	20,400	19,000

Source: http://tpd.azdot.gov/datateam/documents/SHSAADT0305.xls

Figure 2-1 shows the existing traffic volumes for selected streets in the study area.

2.1.2 Future Scenarios

In addition to the Scenario 1 – No-Build, two build scenarios were developed and analyzed to determine which situation would be more critical so recommendations can be made for the Rattlesnake Wash TI. Scenario 2 – Rattlesnake Wash TI contains only the Rattlesnake Wash TI and I-40 and Mohave Drive. Scenario 3 – Full Build includes the proposed Kingman Crossing interchange on I-40 and Kingman Crossing Boulevard.

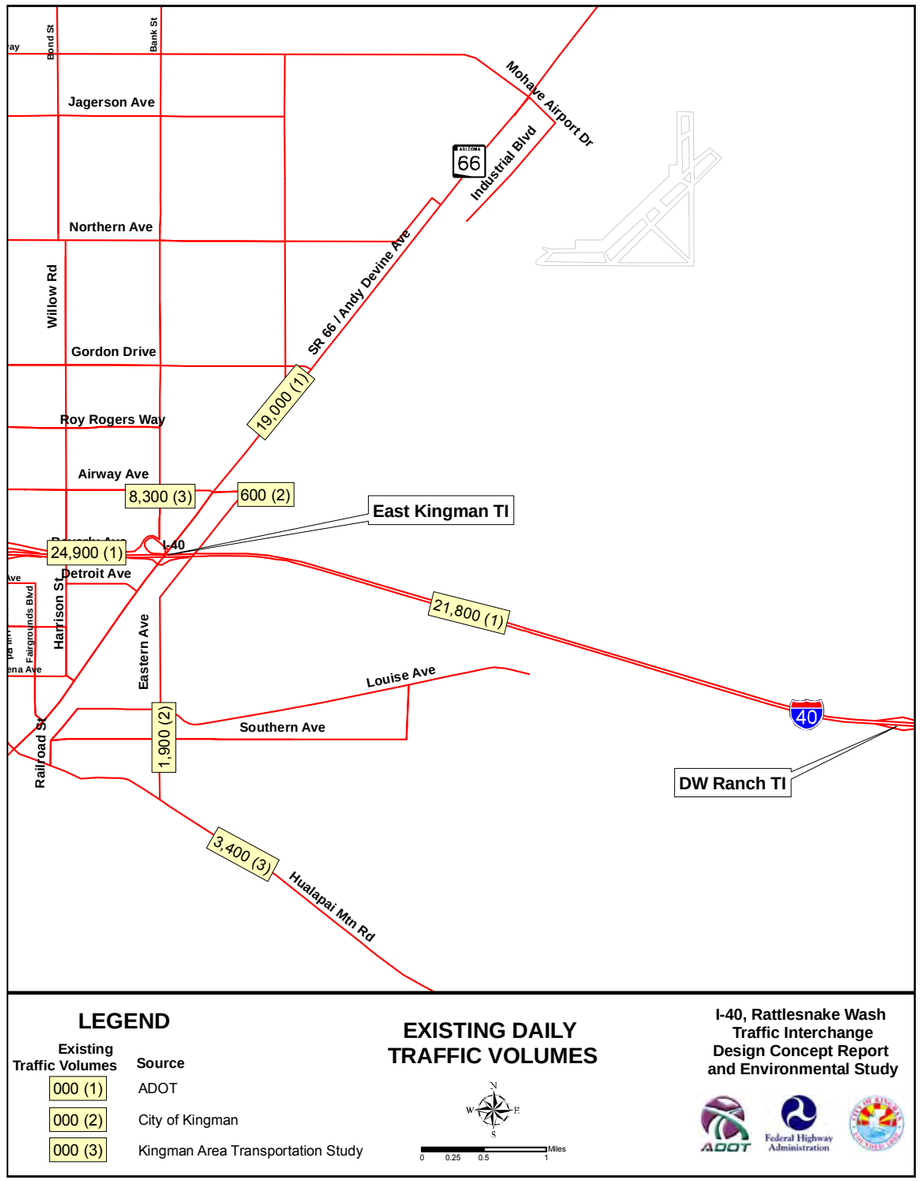


Figure 2-1 Existing Daily Traffic Volumes

2.2 TRAVEL FORECASTING MODEL

The I-40 Rattlesnake Wash TI Study builds on the transportation model developed for the KATS. The socioeconomic data and roadway network in the model were updated to the Year 2030 for this study. The proposed roadway improvements and modifications were based on an analysis of volumes extracted from the updated Year 2030 version of the KATS travel demand model.

The KATS model was originally developed for a forecast year of 2023. The socioeconomic data were updated to the Year 2030 for this study. The COK provided updated land use plans and development plans, serving as the basis for updating from 2023 to 2030. Overall the population estimate went from 77,748 (KATS Year 2023 estimate) to an estimated 100,166 for the Year 2030. This is approximately a 29 percent increase or a growth rate of just under 4 percent per year, which is the same growth rate used in the original KATS study.

The model roadway network was also updated for this study. The original 2023 network, updated to Year 2030, served as the No-Build scenario, and two Year 2030 Build scenarios were developed to evaluate traffic impacts on Mohave Drive, the Rattlesnake Wash TI, and on I-40. Both Build scenarios included Mohave Drive and the Rattlesnake Wash TI. *Scenario 2 – Rattlesnake Wash TI*, contained only the Rattlesnake Wash TI at Mohave Drive. *Scenario 3 – Full Build* modeled an additional interchange, Kingman Crossing TI, directly to the west of the Rattlesnake Wash TI.

Figure 2-2 shows the original KATS network and the updated build networks. The *Scenario 1 – No Build* network is based on the 2023 original KATS network with some minor modifications in the study area.

Scenario 2 – Rattlesnake Wash TI includes the following changes over *Scenario 1 – No Build*:

- Mohave Drive was added from Industrial Boulevard to Hualapai Mountain Road, with the Rattlesnake Wash TI at I-40.
- Airway Avenue was extended to Mohave Drive.
- The nodes representing traffic analysis zones (TAZs) 51, 85, and 91 were moved along with their centroid connectors, reflecting the new developments.
- An additional centroid connector was added from TAZ 80 to Mohave Drive, reflecting access to/from the new industrial park near the airport.

Scenario 3 – Full Build includes all the changes from *Scenario 2 – Rattlesnake Wash TI* with the following additions:

- Kingman Crossing Boulevard was added along with the Kingman Crossing interchange at I-40.
- An additional centroid connector was added between TAZ 91 and Lyons Road.

2.2.1 Year 2030 Daily Volumes

The updated KATS model was run with the new socioeconomic data and networks. The Year 2030 daily traffic volume output from these model runs is shown in the figures below. **Figure 2-3** shows the Year 2030 daily traffic volumes for the No Build scenario (*Scenario 1 – No Build*). *Scenario 2 – Rattlesnake Wash TI* contains only the Rattlesnake Wash TI and is shown in **Figure 2-4**. **Figure 2-5** (*Scenario 3 – Full Build*) shows the Year 2030 daily traffic volumes with both interchanges included.

As shown in the figures:

- South of Airway Avenue, Mohave Drive carries more traffic in *Scenario 2 – Rattlesnake Wash TI* than in *Scenario 3 – Full Build*. This was generally expected considering that *Scenario 3 – Full Build* has an additional interchange to the west.
- TAZ 91 has an additional centroid connector to the west connecting with Lyons Road that carries a large amount of traffic.
- The west side ramps of the Rattlesnake Wash TI in *Scenario 2 – Rattlesnake Wash TI* have about twice the daily traffic volume as in *Scenario 3 – Full Build*. The updated KATS model indicates that the additional interchange at Kingman Crossing reduces traffic around the Rattlesnake Wash TI, as shown in **Figure 2-4** and **Figure 2-5**.

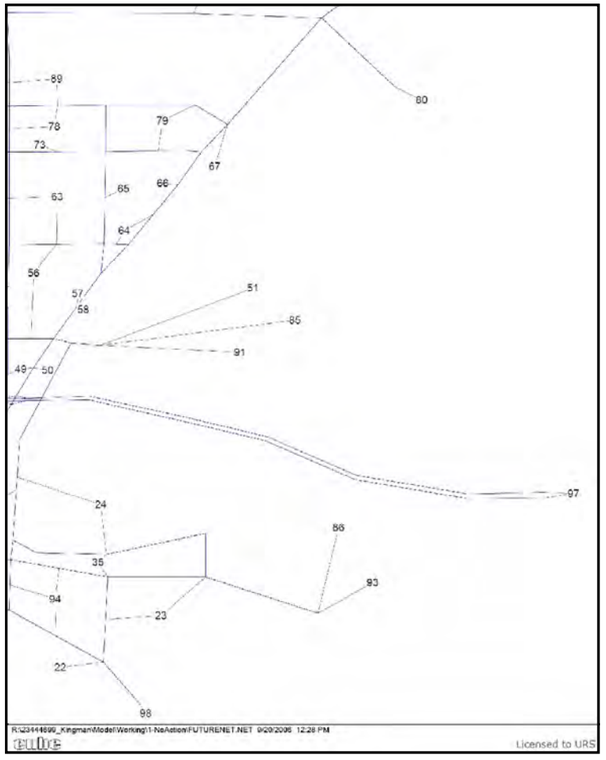
Forecasted volumes on the surrounding streets for all three scenarios are show in **Figure 2-6**.

Compared to the *Scenario 1 – No-Build* scenario, *Scenario 3 – Full Build* reduces traffic on Andy Devine Avenue, Airway Avenue (east of Eastern Avenue), and Southern Avenue[1]. The biggest volume decreases occur on Andy Devine Avenue and on Airway Avenue (east of Eastern Avenue), indicating that I-40 via Mohave Drive provides an attractive route to access the east Kingman area. With Mohave Drive now connecting to Hualapai Mountain Road, volumes on Hualapai Mountain Road increase from 4,300 to 7,000.

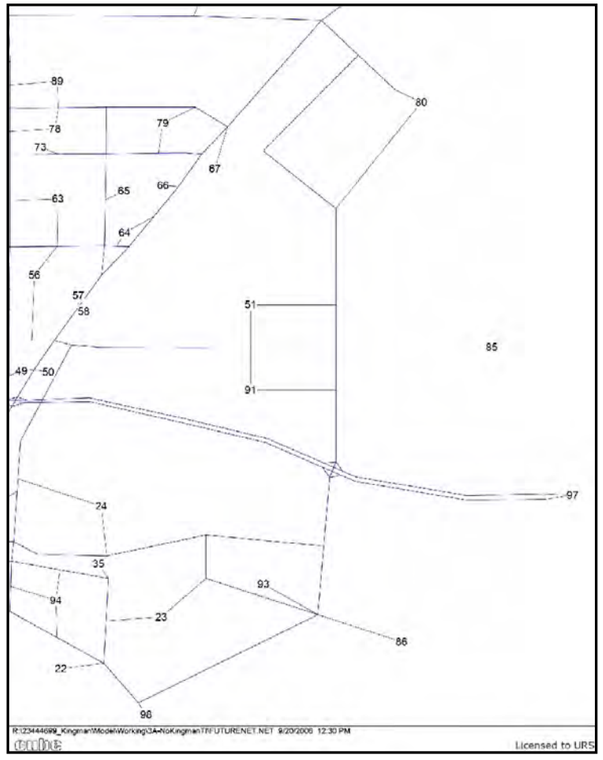
The *Scenario 2 – Rattlesnake Wash TI* scenario follows the same general distribution of traffic as *Scenario 3 – Full Build*, compared to *Scenario 1 – No-Build*. However, in most cases traffic volumes are slightly higher than in *Scenario 3 – Full Build*, probably because the network in *Scenario 2 – Rattlesnake Wash TI* has fewer roads than in *Scenario 3 – Full Build*.

Under both Build scenarios, several new roads are added, including Industrial Boulevard, the extension of Airway and Louise Avenues to the new arterial, Mohave Drive. In general, *Scenario 2 – Rattlesnake Wash TI* has higher volumes on these streets. The larger differences are seen on Industrial Boulevard, Airway Avenue, and Louise Avenue, with nominal differences on Andy Devine Avenue, Hualapai Mountain Road, and Southern Avenue.

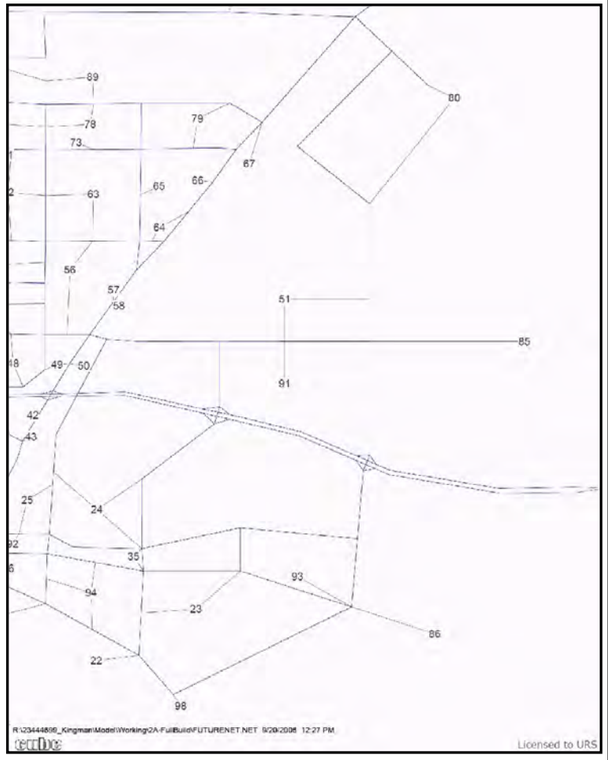
[1] This is largely due to the extension of Louise Avenue to Mohave Drive under the Build scenarios. Louise Avenue diverts ~6,000 vehicles daily from Southern Avenue.



Year 2030 Scenario 1: No-Build Network



Year 2030 Scenario 2: Rattlesnake Wash TI Network



Year 2030 Scenario 3: Full Build Network

YEAR 2030 MODEL NETWORKS

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I-40, Rattlesnake Wash Traffic Interchange Design Concept Report and Environmental Study

ADOT

Figure 2-2 Year 2030 Model Networks

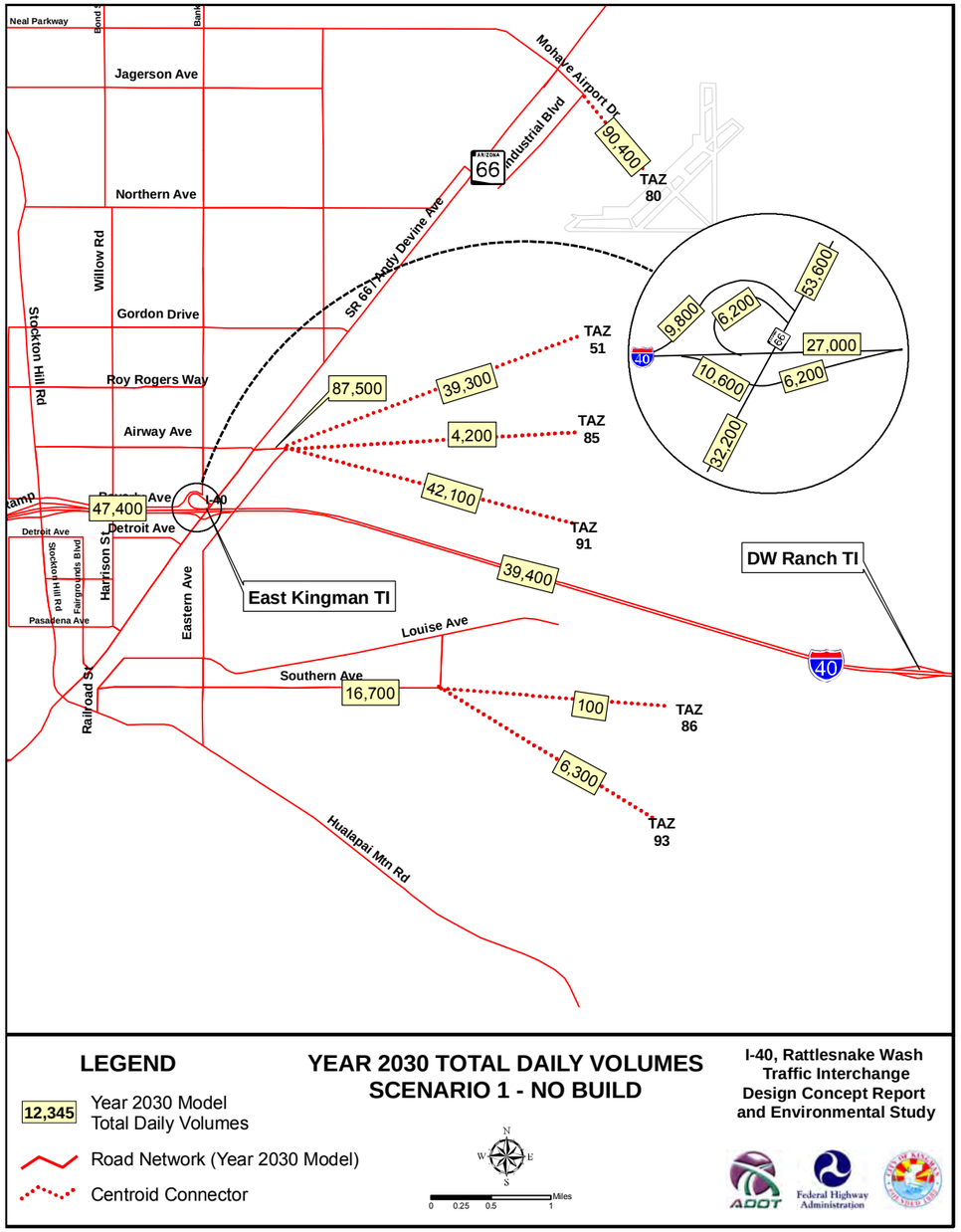

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Figure 2-3 Year 2030 Daily Traffic Volumes: Scenario 1 – No Build

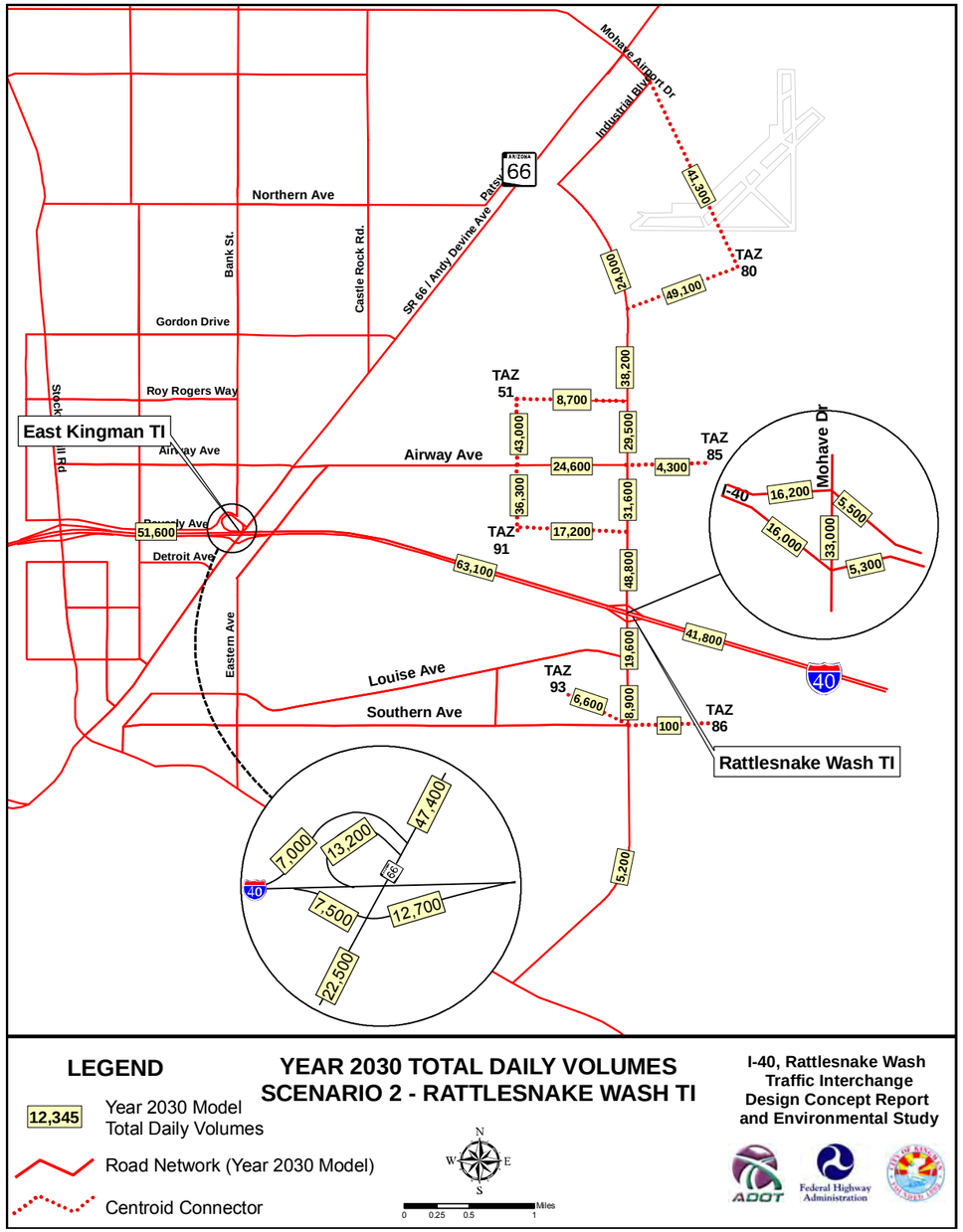

Figure 2-4 Year 2030 Daily Total Volumes: Scenario 2 – Rattlesnake Wash TI

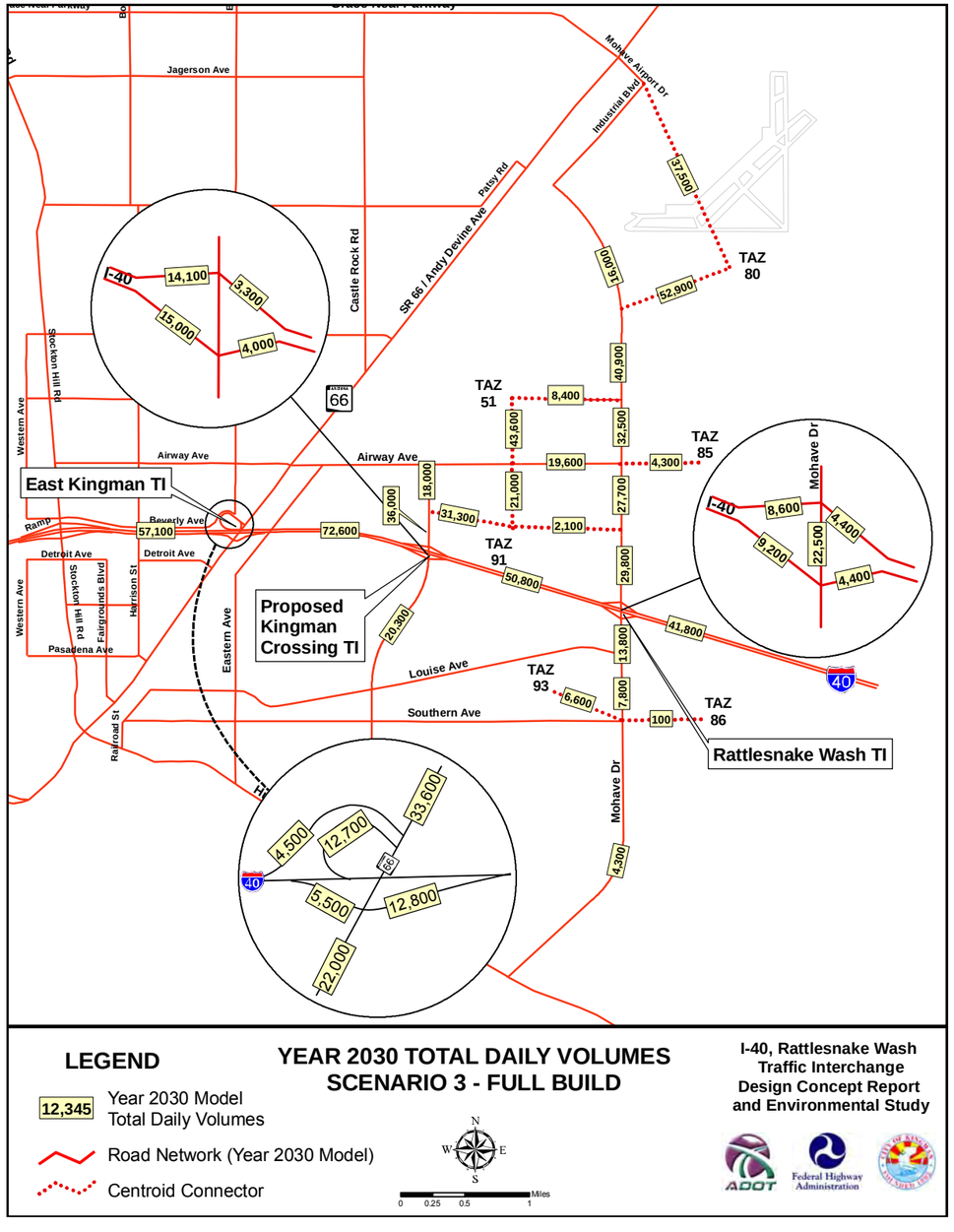

Figure 2-5 Year 2030 Daily Traffic Volumes: Scenario 3 – Full Build

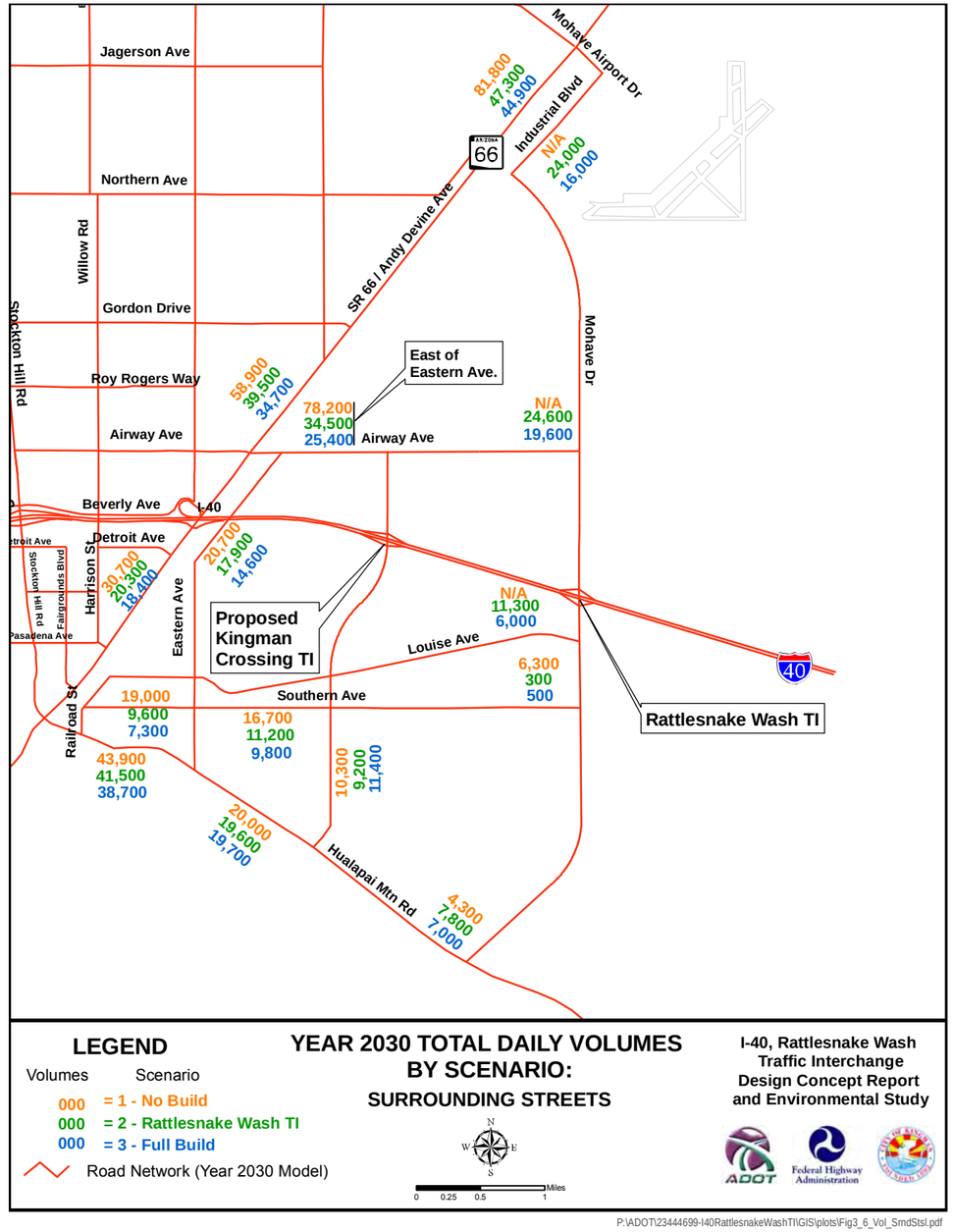

Figure 2-6 Year 2030 Total Daily Volumes by Scenario: Surrounding Streets

2.2.2 Interim Year 2012 Daily Volumes

The Rattlesnake TI is expected to open in the Year 2012. An Interim Year 2012 model was run to provide an estimate for the minimum number of lanes required for Mohave Drive when the TI opens.

To estimate the 2012 population and employment numbers, the TAZs were divided into two main groups: those TAZs with build-out in Year 2023 (most of the TAZs) and those with build-out in Year 2030. For most TAZs, the individual average annual growth rate was calculated (from Year 2003 to Year 2023 or to Year 2030, depending on the build-out year). That rate was then applied by development type (population, retail employment, etc.) to the existing population or employment number over a period of 9 years (2003 to 2012). If a TAZ did not have any existing development in Year 2003, it was assumed 45 percent of Year 2023 build-out or 33 percent of Year 2030 build-out would be developed in Year 2012.

Figure 2-7 shows the estimated daily traffic volumes for Scenario 2 – Rattlesnake Wash TI for the Interim Year 2012.

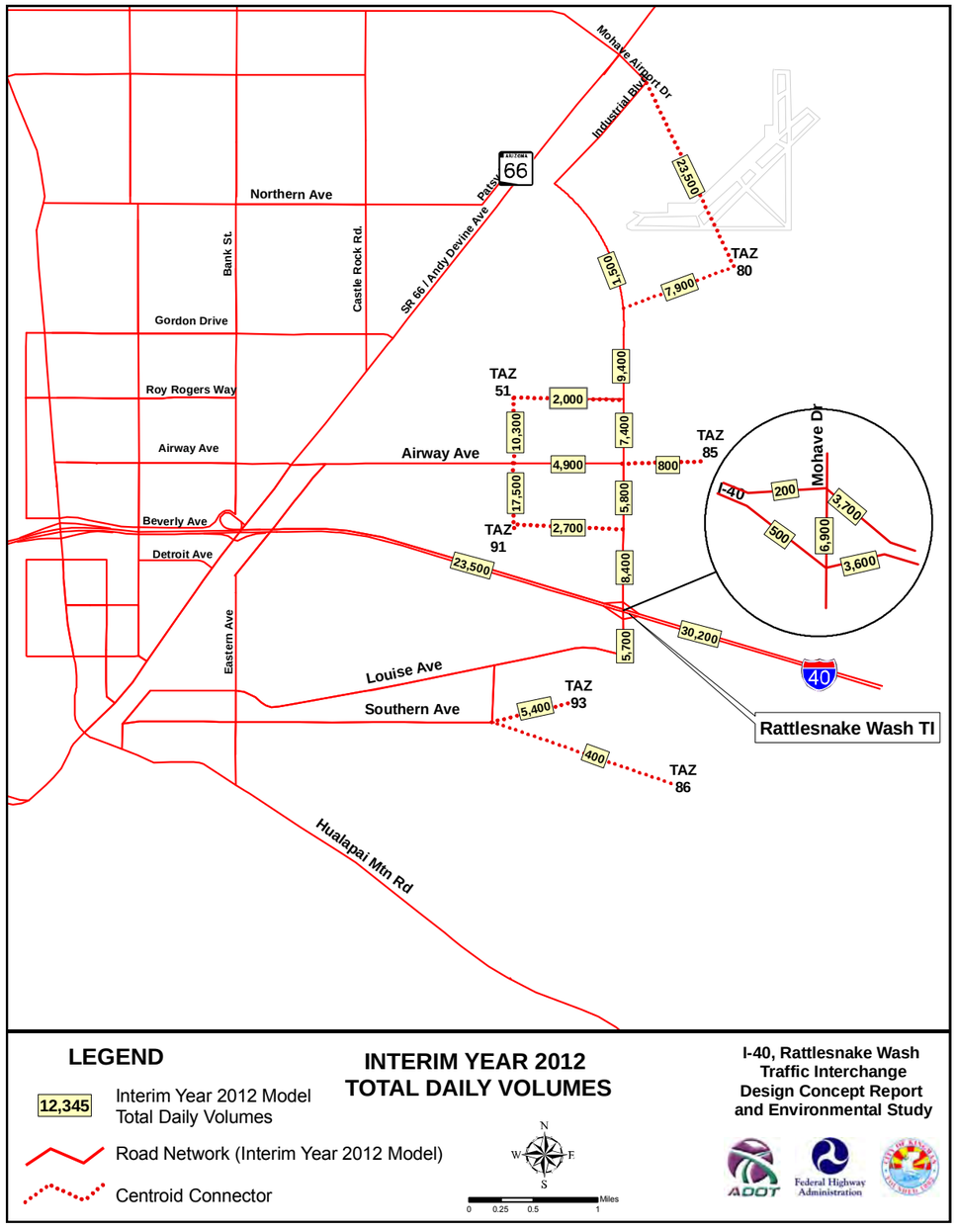

Figure 2-7 Interim Year 2012 Daily Traffic Volumes

2.3 PEAK HOUR VOLUMES

The daily traffic volume output was taken from the two KATS Build models and used to develop peak-hour turning movements on Mohave Drive and I-40. The AM and PM peak hours were each assumed to carry 10 percent of the daily traffic volume; this assumption was used in the previous KATS and modeling effort. The model itself does not assign directional information for the peak hours of traffic. Therefore, peak directional percentage splits were assumed for each peak hour on Mohave Drive and at the interchanges, as shown in **Figure 2-8**.

2.3.1 Mohave Drive

In *Scenario 2 – Rattlesnake Wash TI*, on Mohave Drive north of the access to TAZ 80, 70 percent of the total traffic was assumed to travel southbound in the AM peak hour for employment access to the industrial park (TAZ 80). South of the access to TAZ 80, the split was changed to 65 percent northbound due to the demand of commuter employee trips to the industrial park. South of Airway Avenue, the split was assigned an even 50 percent going northbound and southbound. It was assumed that there was equal demand for access to both I-40 and the industrial park, mostly due to the travel demand from the residential areas (TAZs 51 and 91) east and west of Mohave Drive.

In *Scenario 3 – Full Build*, at the Kingman Crossing TI, AM peak directions of southbound and westbound were assumed with a 55 percent split, and the assumed directional splits on Mohave Drive were maintained from *Scenario 2 – Rattlesnake Wash TI*, as described above.

In the PM peak hour for both scenarios, the assumed directional splits were reversed from what they were in the AM peak hour, reflecting the commuter nature of traffic from work to home.

2.3.2 I-40 Freeway

Peak hour volumes for AM and PM were developed by starting with the volumes for the upstream end of the freeway, then the ramp entering and exiting volumes were added and subtracted to develop I-40 volumes further downstream.

Directional splits applied to the volumes on I-40 ramps were derived based on expected commuter patterns and travel patterns expected on the local street system.

At the Rattlesnake TI ramps, a 55%/45% (westbound/eastbound) split for each peak hour was assumed because we expected the west side ramps to be used almost equally by (1) traffic from nearby residential areas toward employment in Kingman/areas west and south and (2) traffic destined for the employment center at TAZ 80. Directional splits are the same for both Scenarios 2 and 3.

On the east side ramps, assuming the east does not have a large employment destination for Kingman residents, we expect the commuter split would be a 60%/40% split of AM WB off-ramp/EB on-ramp (reversed to 40%/60% in the PM).

At the Kingman TI ramps we would expect a 55%/45% split favoring traffic from nearby residential areas toward employment in Kingman and areas west and south (most TAZ 80-related traffic will use the Rattlesnake TI).

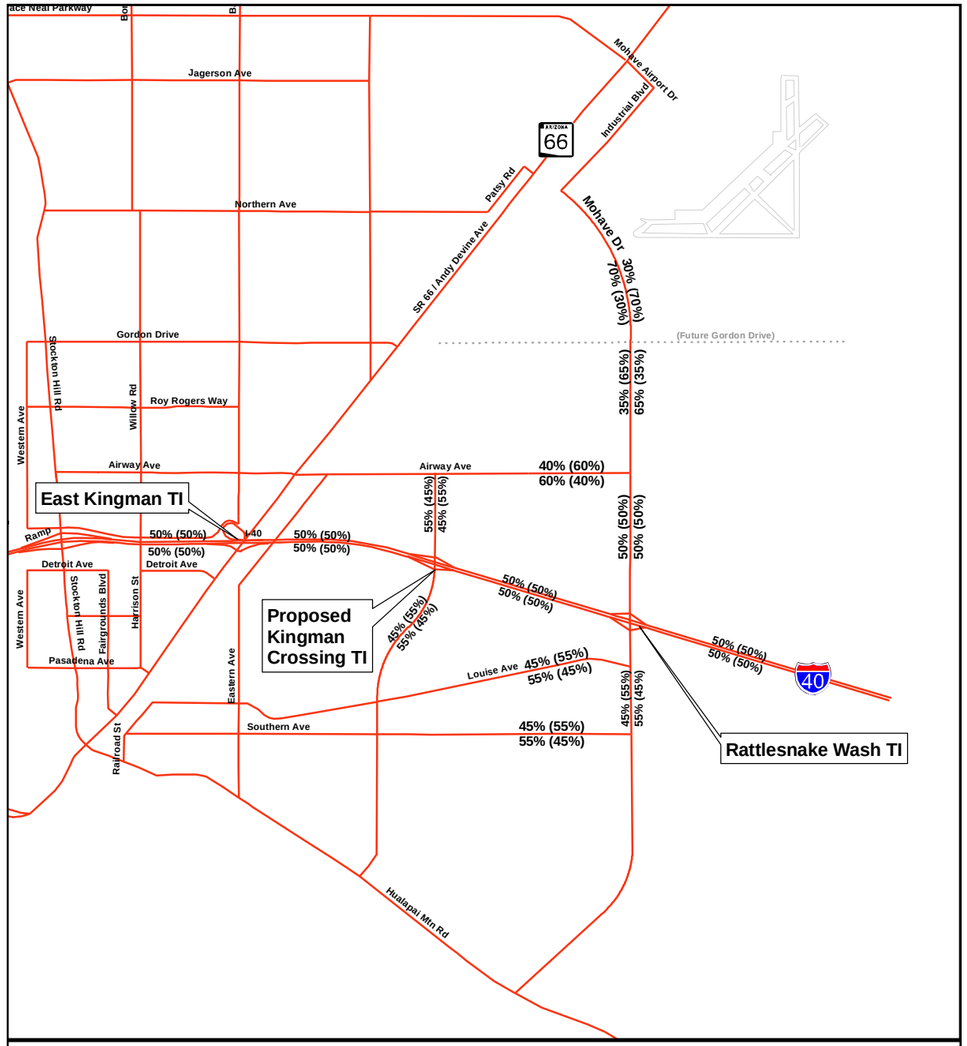

Figure 2-8 Year 2030 Peak Directional Splits

West of the I-40/State Route 66 (East Kingman) TI, a 50 percent/50 percent was assumed, that closely resembles the existing condition and is not expected to change with the proposed development.

The final AM and PM peak hour volumes on I-40 were determined by starting with the volumes at the upstream end of the freeway. Then the ramp entering and exiting volumes were added and subtracted to develop I-40 volumes farther downstream.

2.4 PEAK-HOUR TURNING MOVEMENTS

After developing peak-hour link volumes and directional splits, these volumes were input into a spreadsheet using the methodology outlined in *National Cooperative Highway Research Program* (*NCHRP*) *Report 255*. Some modifications were made to the through traffic volume so that the volumes would balance between intersections.

The final turning movements are shown in **Figure 2-9** and **Figure 2-10**.

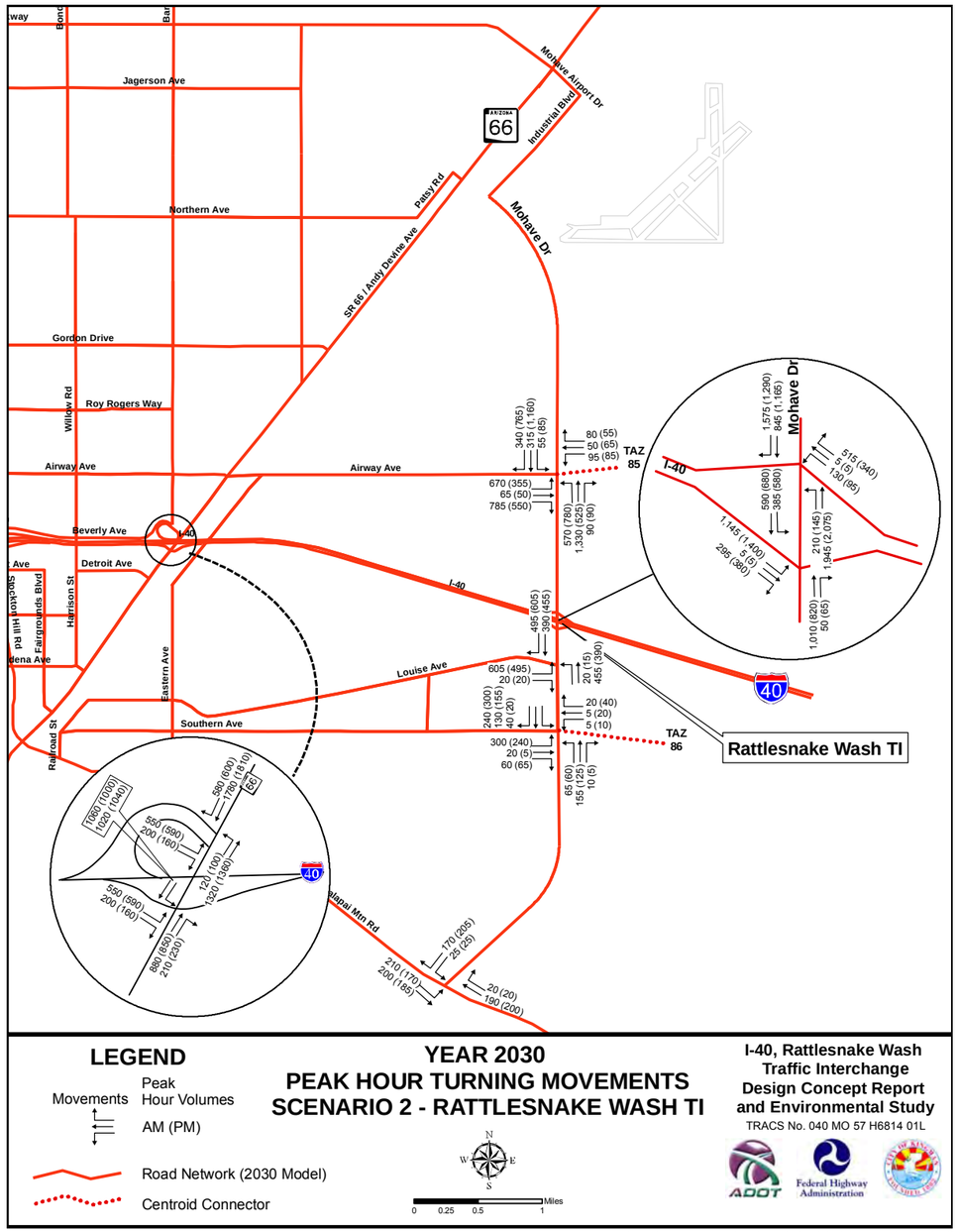

Figure 2-9 Year 2030 Peak Hour Turning Movements: Scenario 2 – Rattlesnake Wash TI

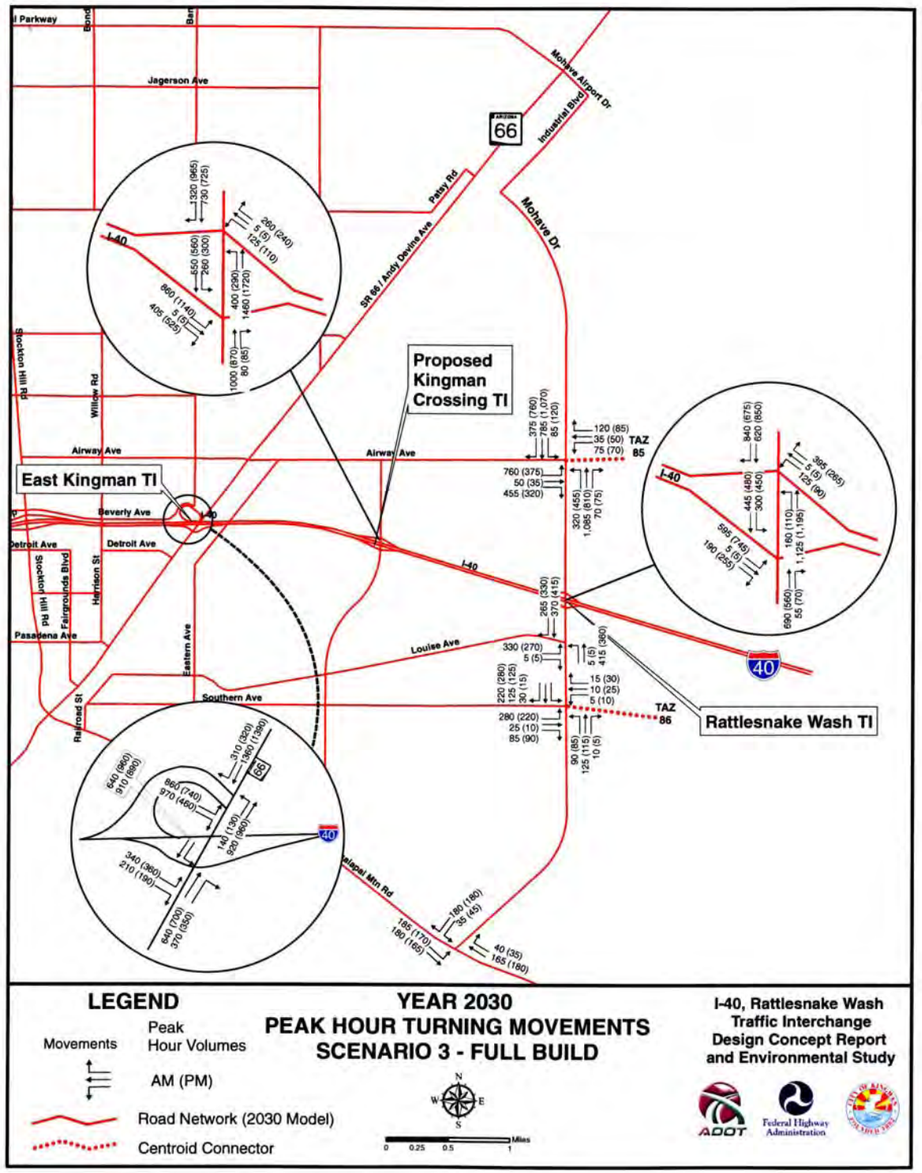

Figure 2-10 Year 2030 Peak Hour Turning Movements: Scenario 3 – Full Build

2.5 TRAFFIC OPERATIONAL ANALYSIS

2.5.1 Year 2030 Mohave Drive Level of Service

Using the turning movement volumes, peak hour level of service (LOS) analysis was conducted. For a signalized intersection, the *Highway Capacity Manual* (HCM), published by the Transportation Research Board, considers the average delay per vehicle to determine the LOS. LOS is calculated for each approach, each turning movement, and for the intersection as a whole. The LOS criteria for signalized intersection control are displayed in **Table 2-2**. The calculations of the average delay and LOS were performed using Synchro 6 software.

Table 2-2 Level of Service Criteria for Signalized Intersections

Intersection Control	Level-of-Service	Average Delay (seconds/vehicle)
Signalized	A	≤ 10
	B	> 10-20
	C	> 20-35
	D	> 35-55
	E	> 55-80
	F	> 80

The LOS for each of the signalized study intersections in both model scenarios was calculated and the results are shown below in **Table 2-3** and **Table 2-4**. All movements and intersections function at a LOS D or better.

The Rattlesnake Wash TI was modeled as a compact diamond interchange. Even with the large turning movements from southbound Mohave Drive to westbound I-40 in the AM peak hour and the reverse movement in the PM peak hour, the LOS at these intersections shows adequate operation in both *Scenario 2 – Rattlesnake Wash TI* and *Scenario 3 – Full Build.*

Table 2-3 Mohave Drive Intersection LOS: Scenario 2 – Rattlesnake Wash TI

	AM, by Approach					PM, by Approach				
Intersection	EB	WB	NB	SB	Total (LOS/ Delay)	EB	WB	NB	SB	Total (LOS/ Delay)
Airway Avenue	C	C	C	B	**C / 24.9**	C	D	C	C	**C / 26.4**
I-40 Westbound Ramps	-	D	B	D	**C / 35.0**	-	D	A	B	**B / 15.5**
I-40 Eastbound Ramps	D	-	D	B	**D / 39.9**	D	-	D	D	**D / 51.0**
Louise Avenue	D	-	B	A	**C / 20.4**	D	-	B	A	**B / 17.9**
Southern Avenue	D	B	A	A	**C / 20.5**	D	B	B	A	**C / 20.6**
Hualapai Mountain Road	B	A	-	A	**B / 10.9**	B	B	-	A	**B / 10.6**

Table 2-4 Mohave Drive Intersection LOS: Scenario 3 – Full Build

Intersection	AM, by Approach					PM, by Approach				
	EB	WB	NB	SB	Total (LOS/ Delay)	EB	WB	NB	SB	Total (LOS/ Delay)
Airway Avenue	C	C	C	C	**C / 25.4**	C	C	C	B	**B / 19.9**
I-40 Westbound Ramps	-	B	A	A	**A / 8.8**	-	B	A	A	**A / 7.6**
I-40 Eastbound Ramps	C	-	C	B	**C / 22.2**	C	-	C	B	**C / 26.1**
Louise Avenue	D	-	B	A	**B / 18.6**	D	-	B	A	**B / 15.5**
Southern Avenue	D	B	B	A	**C / 20.8**	D	B	A	A	**B / 16.6**
Hualapai Mountain Road	A	A	-	C	**A / 9.3**	A	A	-	C	**A / 10.0**

2.5.2 I-40 Freeway Level of Service

Freeway level of service is determined by the density of vehicles in the freeway section area.

Figure 2-11 illustrates operating characteristics of the freeway at each LOS.

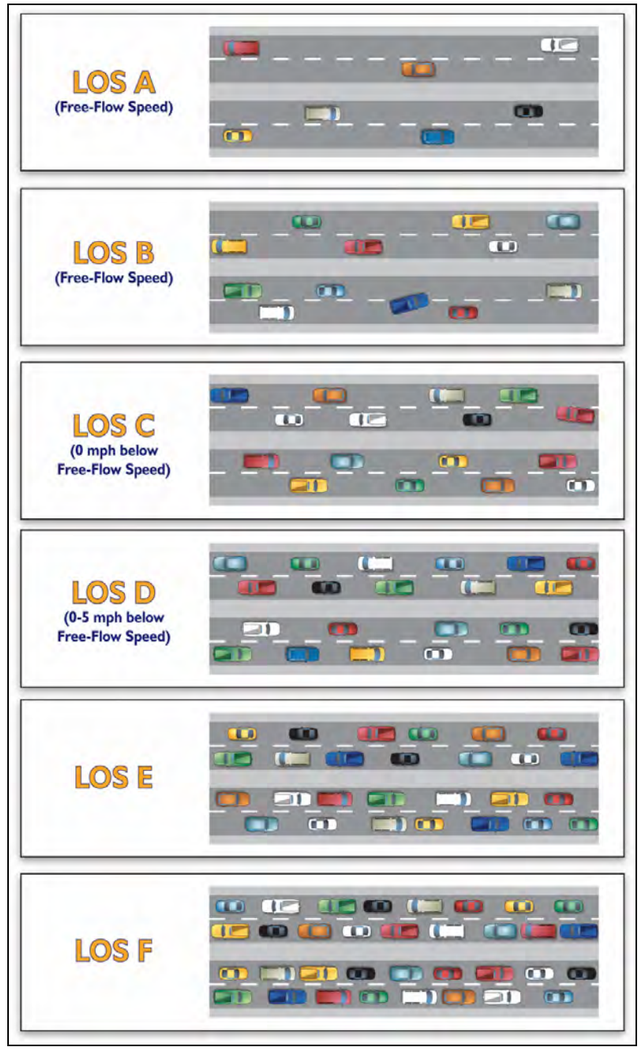

Figure 2-11 Typical Congestion Levels at Each LOS Grade

Freeway level of service on I-40 was analyzed for existing conditions and for year 2030 conditions based on the HCM methodology using the HCS+ software.

2.5.3 I-40 Level of Service – Existing Conditions

Year 2005 average annual daily traffic (AADT) volumes for I-40 between State Route 66 and DW Ranch Road were obtained from the ADOT website. Using these AADT volumes, the peak hour volumes were determined assuming a directional split of 51 percent westbound in the AM peak hour, a peak-hour to AADT ratio (K) of 9 percent, and a truck factor of 15 percent (based on 2004 Highway Performance Monitoring System [HPMS] data for I-40). Assuming a free-flow speed (FFS) of 65 mph and using the generated peak hour volumes and the procedures outlined in the *Highway Capacity Manual* (HCM) for basic freeways, the mainline I-40 level-of-service (LOS) was determined as shown in **Table 2-5**.

Table 2-5 I-40 Mainline Level-of-Service (Year 2005)

I-40 Mainline			2005 AADT[1]	Freeway Peak-Hour Volume[2]	Freeway LOS
From	To	Direction		Pcphpl (AM/PM)	(AM/PM)
Exit 53, SR 66 / SB 40	Exit 59, DW Ranch Rd	EB	21,800	543 / 566	A / A
Exit 59, DW Ranch Rd	Exit 53, SR 66 / SB 40	WB		566 / 543	A / A
Exit 52, Stockton Hill	Exit 53, SR 66 / SB 40	EB	24,900	601 / 578	A / A
Exit 53, SR 66 / SB 40	Exit 52, Stockton Hill	WB		578 / 601	A / A

(1) Source: http://tpd.azdot.gov/datateam/documents/SHSAADT0305.xls (includes both freeway directions)

(2) Assuming a free-flow speed of 65 mph, a directional split of 51 percent westbound in the AM peak hour, a peak-hour to AADT ratio (K) of 9 percent, and a truck factor of 15 percent, based on 2004 Highway Performance Monitoring System data for I-40.

Existing ramp operation for both the merge and diverge conditions during the AM and PM peak hours at the East Kingman TI all operate at LOS B.

During the Year 2005 peak hours, the I-40 mainline between Exit 52 and Exit 59 is operating at LOS A and is experiencing no problems.

2.5.4 I-40 Level of Service – Year 2030

2030 Freeway level of service on I-40 was analyzed for both model scenarios based on the HCM using the HCS+ software. The following assumptions were used in the HCS+ software:

- Peak hour factor = 0.95
- Heavy vehicle percentage = 20 percent
- I-40 free-flow speed = 65 mph
- Ramp free-flow speed = 45 mph
- Length of deceleration lane = 1,300 feet
- Distance between interchange ramps (gore to gore)
  - East Kingman (Andy Devine) TI to Kingman Crossing TI = 6,300 feet (westbound), 5,000 feet (eastbound)
  - Kingman Crossing TI to Rattlesnake Wash TI = 5,200 feet
- I-40 number of lanes = 4
- Lane widths = 12 feet
- Shoulder Widths = Ideal

Figure 2-12 shows the level of service and volumes for both scenarios. The target LOS for design was LOS C. The distance between interchanges was large enough that weaving was not a consideration. Most of the freeway sections and ramp junctions work acceptably, with a LOS C or better.

In Scenario 1 – No Build, Freeway and ramp operations on I-40 and at the East Kingman TI ramps operate at LOS C or better. This condition exists because there is no access to I-40 east of the East Kingman TI and mobility is constrained to city streets.

In *Scenario 2 – Rattlesnake Wash TI*, with only one interchange in this stretch of interstate, there is lower demand on I-40 as compared to *Scenario 3 – Full Build*. Between the East Kingman TI and the Rattlesnake Wash TI, I-40 operates at LOS D, with I-40 west of the East Kingman TI and east of the Rattlesnake Wash operating at LOS C. The ramp merge/diverge operations were found to operate at LOS C or better, except East Kingman TI west side ramps which are at LOS D. Freeway and ramp merge/diverge operations improve to LOS C with the addition of either an auxiliary lane between the East Kingman TI and the Rattlesnake Wash TI in both directions, or a third through lane in both directions.

In *Scenario 3 – Full Build*, traffic is highest on I-40 due to the additional traffic being able to access I-40 from both new TIs. West of the Kingman Crossing TI, I-40 operates at LOS E during the AM peak hour westbound, and both peak hours during the PM peak hour eastbound, with the existing interstate configuration. This is due to the large volume entering and exiting on the west side ramps. Freeway and ramp merge/diverge operations improve to LOS C with the addition of an auxiliary lane in both directions, connecting the Kingman Crossing ramps to the ramps at the East Kingman TI, or by the addition of a third through lane in each direction.

2.5.5 Year 2030 Truck Volume Sensitivity Analysis

The project team was directed by ADOT to investigate a range of truck percentages based on projected 30 percent truck traffic on I-40 than what was originally assumed from the 20 percent truck volume data. The analysis was expanded to west of the East Kingman TI to the Stockton Hill TI on I-40. The sensitivity analysis includes increasing the truck percentages based on a ratio of expected vehicle traffic within the study area and projected truck traffic on I-40. The target Level of Service for freeway operations is LOS C.

Because vehicle traffic on certain segments are expected to grow at a rate higher than the expected truck traffic, the base assumption was to use a 30 percent truck percentage on I-40 as a worst case, and adjust this percentage to expected growth in vehicle traffic. Another assumption of this scenario is that ramp traffic would retain the 20 percent truck percentage used in the previous analysis. **Table 2-6** shows the assigned truck percentages by scenario and segment.

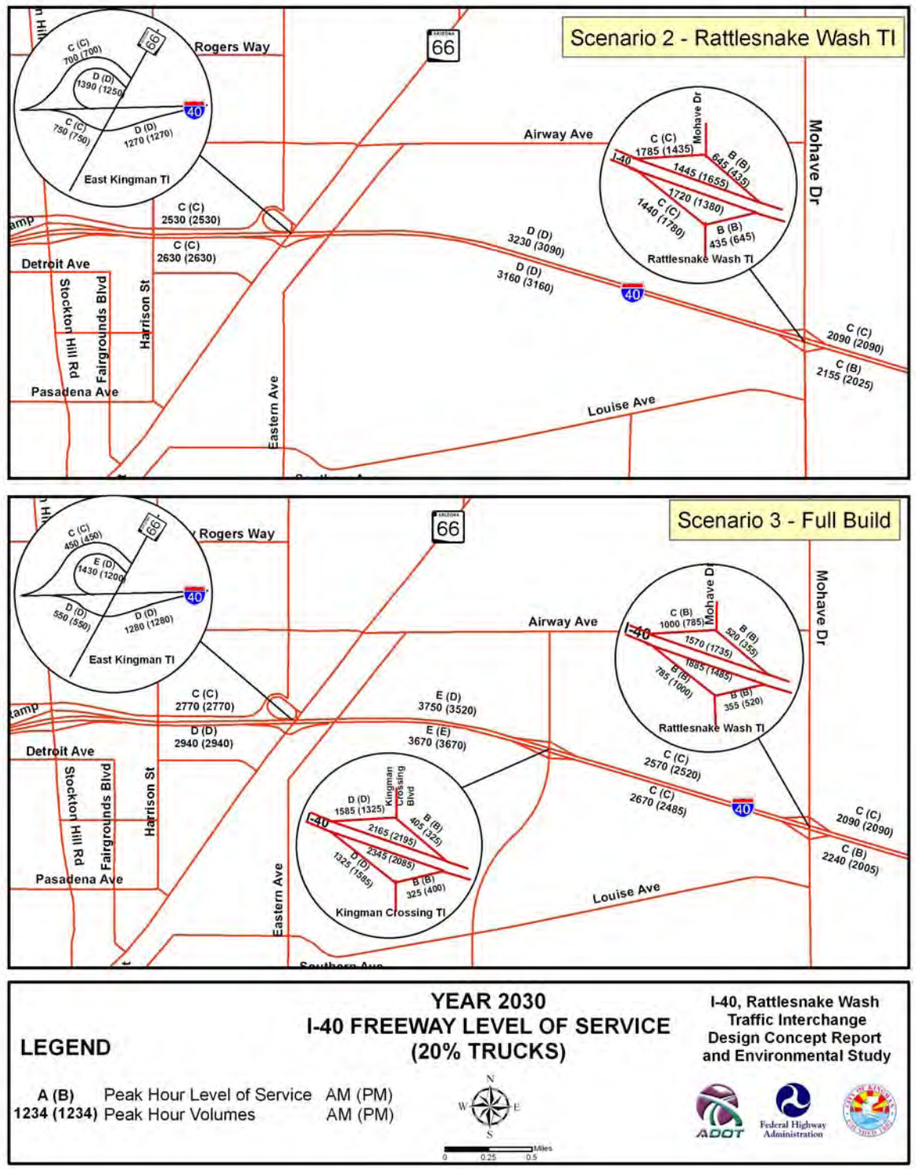

Figure 2-12 Year 2030 I-40 Freeway Level of Service

These truck percentages were input into the HCS+ software and analyzed in order to identify any operational issues with the higher truck percentages. The results for scenarios for the variable truck percentage increase in the truck percentages on I-40 are shown along side the previous 20 percent truck percentage analysis in **Table 2-7** and **Table 2-8**.

Table 2-6 Year 2030 Truck Percentages by Scenario and Segment

I-40 Segment	% Trucks
Scenario 2 – Rattlesnake Wash TI	
Stockton Hill TI to East Kingman TI	26
East Kingman TI to Rattlesnake Wash TI	28
Rattlesnake Wash TI to DW Ranch Road TI	30
Scenario 3 –Full Build	
Stockton Hill TI to East Kingman TI	26
East Kingman TI to Kingman Crossing TI	24
Kingman Crossing to Rattlesnake Wash TI	27
Rattlesnake Wash TI to DW Ranch Road TI	30

Table 2-7 Scenario 2 – Rattlesnake Wash TI LOS Results Comparison 20% Trucks and Variable Truck Percentages

	AM LOS			PM LOS		
		Variable			Variable	
I-40 Segment	20% Trucks	% Trucks	LOS	20% Trucks	% Trucks	LOS
Freeway EB Stockton Hill TI to East Kingman TI	C	26	C	C	26	C
East Kingman TI EB Diverge	C	26	C	C	26	C
East Kingman TI EB Merge	D	28	D	D	28	D
Freeway EB East Kingman TI to Rattlesnake Wash TI	D	28	D	D	28	D
Rattlesnake Wash TI EB Diverge	C	28	C	C	28	C
Rattlesnake Wash TI EB Merge	B	30	B	B	30	B
Freeway EB East of Rattlesnake Wash TI	C	30	C	B	30	C
Freeway WB East of Rattlesnake Wash TI	C	30	C	C	30	C
Rattlesnake Wash WB Diverge TI	B	30	B	B	30	B
Rattlesnake Wash WB Merge TI	C	28	C	C	28	C
Freeway WB East Kingman TI to Rattlesnake Wash TI	D	28	D	D	28	D
East Kingman TI WB Diverge	D	28	D	D	28	D
East Kingman TI WB Merge	C	26	C	C	26	C
Freeway WB East Kingman TI to Stockton Hill TI	C	26	C	C	26	C

The variable truck percentage analysis assumed ramp truck percentages at 15%
Truck adjustment factors for percentages above 25% are shown below
P_t = 26%; f_{hw} = 0.885
P_t = 28%; f_{hw} = 0.877
P_t = 30%; f_{hw} = 0.870

The result of the variable truck percentage analysis for this project, *Scenario 2 – Rattlesnake Wash TI*, indicates that there is virtually no change in LOS from the 20 percent truck percentage analysis and the variable truck percentage. The result of the variable truck percentage analysis for *Scenario 3 – Full Build* does not vary substantially from the 20 percent truck percentage analysis. However, the LOS in both directions for the section of I-40 between the East Kingman TI and the proposed Rattlesnake Wash TI falls to LOS D.

The results shown for the *Scenario 3 – Full Build* indicate the freeway is at the capacity threshold between the East Kingman TI and the Kingman Crossing TI. The increase in truck traffic degrades the eastbound and westbound segment of I-40 between the East Kingman TI and the Kingman Crossing TI to LOS E at Year 2028 for eastbound and Year 2029 for westbound. In addition, the section of freeway between the East Kingman TI and the Stockton Hill TI is expected to operate at LOS D in the 2030 condition.

Table 2-8 Scenario 3 – Full Build LOS Results Comparison
20% Trucks and Variable Truck Percentages

I-40 Segment	AM LOS			PM LOS		
	20% Trucks	Variable % Trucks	Variable LOS	20% Trucks	Variable % Trucks	Variable LOS
Freeway EB Stockton Hill TI to East Kingman TI	D	26	D	D	26	D
East Kingman TI EB Diverge	D	24	D	D	24	D
East Kingman TI EB Merge	D	26	D	**E**	26	**E**
Freeway EB East Kingman TI to Kingman Crossing TI	**E**	24	**E**	**E**	24	**E**
Kingman Crossing TI EB Diverge	D	24	D	D	24	D
Kingman Crossing TI EB Merge	C	27	C	B	27	C
Freeway EB Kingman Crossing TI to Rattlesnake Wash TI	C	27	C	C	27	C
Rattlesnake Wash TI EB Diverge	B	27	B	B	30	B
Rattlesnake Wash TI EB Merge	B	30	B	B	27	B
Freeway EB East of Rattlesnake Wash TI	C	30	C	B	30	C
Freeway WB East of Rattlesnake Wash TI	C	30	C	C	30	C
Rattlesnake Wash WB Diverge TI	B	30	B	B	27	B
Rattlesnake Wash WB Merge TI	C	27	C	B	30	C
Freeway WB Rattlesnake Wash to Kingman Crossing TI	C	27	C	C	27	C
Kingman Crossing TI WB Diverge	B	27	B	B	24	B
Kingman Crossing TI WB Merge	D	24	D	D	27	D
Freeway WB Kingman Crossing TI to East Kingman TI	**E**	24	**E**	D	24	D
East Kingman TI WB Diverge	**E**	24	**F**	D	24	**E**
East Kingman TI WB Merge	C	26	C	C	26	C
Freeway WB East Kingman TI to Stockton Hill TI	C	26	C	C	26	C

The variable truck percentage analysis assumed ramp truck percentages at 15%
Truck adjustment factors for percentages above 25% are shown below
P_t = 26%; f_{hw} = 0.885
P_t = 27%; f_{hw} = 0.881
P_t = 28%; f_{hw} = 0.877
P_t = 30%; f_{hw} = 0.870

2.5.6 Projected Future Need for I-40 Improvements

For this project, *Scenario 2 – Rattlesnake Wash TI*, the truck sensitivity analysis revealed that for I-40 between the East Kingman TI and the Rattlesnake TI, the LOS will degrade to LOS D and improvements will be required on I-40. An analysis was performed in order to identify the extent of necessary improvements and a time line for these improvements.

For *Scenario 3 – Full Build*, the truck sensitivity analysis revealed that I-40 between Kingman Crossing TI and East Kingman TI is at the threshold LOS E for the 2030 design year. Further analysis was performed in order to identify improvements and a time line for these improvements. The analysis focused on only those freeway segments projected to operate at LOS D or worse for both Scenario 2 and Scenario 3.

For *Scenario 2 – Rattlesnake Wash*, the results of the LOS analysis and the projected target year requiring improvements to achieve LOS C (or better) is 2027.

For *Scenario 3 – Full Build*, the results of the LOS analysis and the projected target year requiring improvements to achieve LOS C (or better) is shown in **Table 2-9** below.

Table 2-9 Scenario 3 – Full Build, Projected Improvement Year
20% Trucks and Variable Truck Percentages with Planned I-40 Widening

Scenario 3 – Full Build, Projected Improvement Year				
	AM		PM	
I-40 Segment	20% Trucks	Variable % Trucks	20% Trucks	Variable % Trucks
East Kingman TI EB Merge	2026	2025	2026	2025
Freeway EB East Kingman TI to Kingman Crossing TI	2026	2025	2026	2025
Kingman Crossing TI EB Diverge	2026	2025	2026	2025
Kingman Crossing TI WB Merge	2026	2025	2026	2025
Freeway WB Kingman Crossing TI to East Kingman TI	2026	2025	2026	2025
East Kingman TI WB Diverge	2026	2025	2026	2025
Freeway EB Stockton Hill to East Kingman TI	2029	2029	2029	2029
East Kingman TI EB Diverge	2029	2029	2029	2029

An estimation of the target year that would require improvements to I-40 west of the Kingman Crossing TI to the East Kingman TI to achieve LOS C is 2025. There was some slight variation in the analysis of the freeway for the east and westbound directions that showed the westbound portion of the freeway will require upgrading first, followed by the eastbound portion of I-40. However, the threshold LOS for both segments is very similar, and will most likely require freeway improvements at the same time.

2.5.7 State Planned Improvements for I-40

Based on ADOT's MoveAZ 20-year long-range transportation plan, I-40 will be widened from two lanes to three lanes in each direction within the study area. Prioritization of these planned improvements identified in this report will satisfy the LOS C operational requirement for both mainline and ramps within the study area. The projected target year requiring a third lane in each direction to achieve LOS C (or better) is 2027 for Scenario 2 – Rattlesnake Wash and 2025 for Scenario 3 – Full Build. **Figure 2-13** shows the Year 2030 LOS with three lanes in each direction.

2.6 ACCIDENT ANALYSIS

Collision data along I-40 from the Andy Devine TI (MP 53) to the DW Ranch TI (MP 59) were obtained from the ADOT Traffic Records Branch for the period from February 1, 2003 to January 31, 2006. These data include the collision manner, collision type, and collision severity. Summaries of the collision type are shown in **Table 2-10**.

Table 2-10 Collision Type Summary

Collision Type	Year			Total	Percent
	2003	2004	2005		
Collision with Other Motor Vehicle	14	2	1	**17**	**42.5%**
Overturning	3	3	5	**11**	**27.5%**
Breakage – Part of Vehicle	1	2	1	**4**	**10.0%**
Object in Roadway	0	2	0	**2**	**5.0%**
Collision with Guardrail	2	0	0	**2**	**5.0%**
Collision with Median	1	0	0	**1**	**2.5%**
Crossover	0	0	1	**1**	**2.5%**
Collision with Curb	0	0	1	**1**	**2.5%**
Object Dropped	0	1	0	**1**	**2.5%**
Total	**21**	**10**	**9**	**40**	**100.0%**

Data from February 1, 2003 to January 31, 2006.
Source: ADOT Traffic Records Branch.

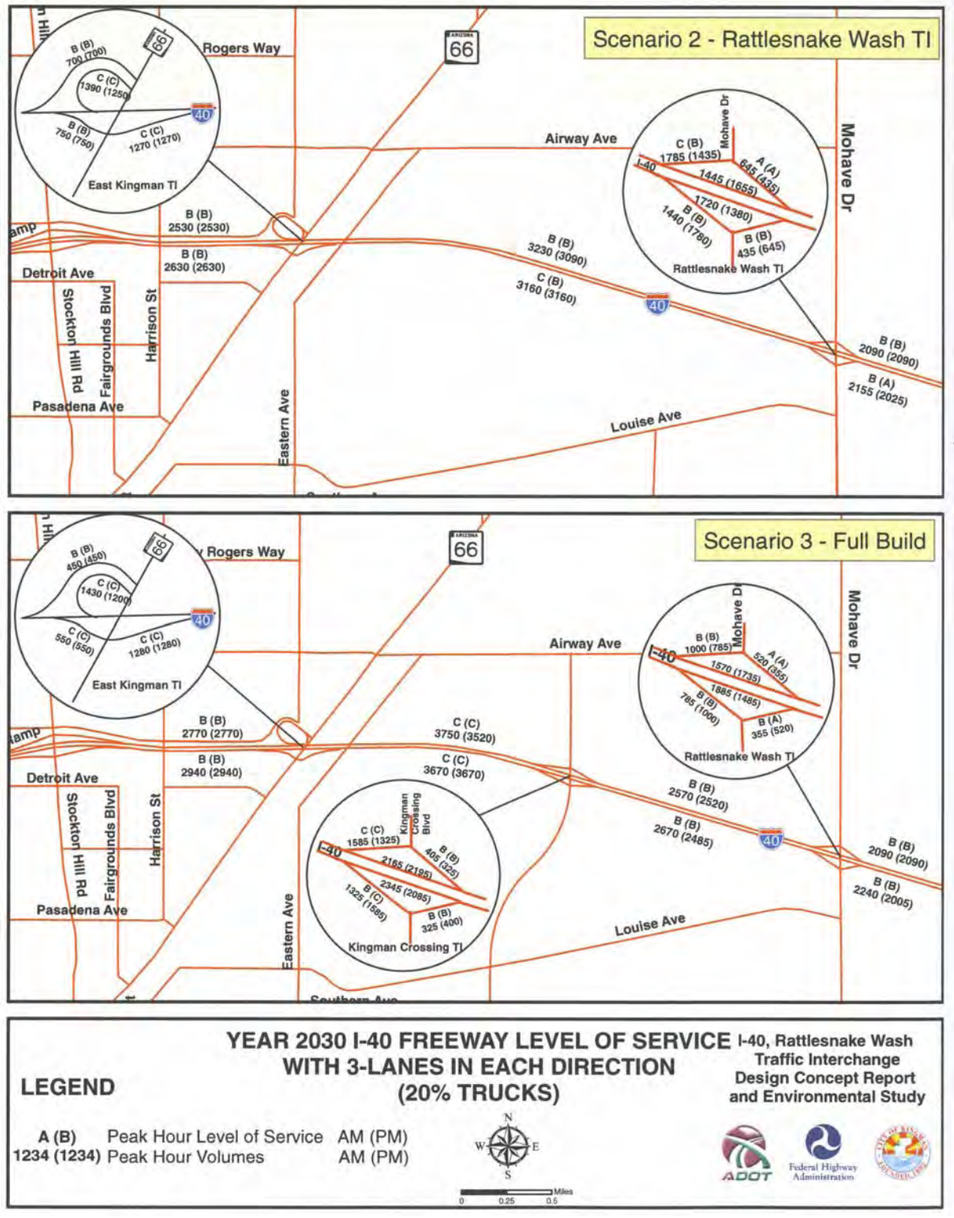

Figure 2-13 Year 2030 I-40 Freeway Level of Service with Three Lanes in Each Direction

Seventeen (42.5 percent) of the 40 collisions involved other motor vehicles and 11 (27.5 percent) were overturning collisions. These two collision types account for 70 percent of the total collisions over this time period. Summaries of the collision manner are shown in **Table 2-11** below.

Table 2-11 Collision Manner Summary

Collision Manner	Year			Total	Percent
	2003	2004	2005		
Single Vehicle	6	6	7	**19**	**47.5%**
Rear End	9	1	1	**11**	**27.5%**
Sideswipe (same direction)	3	1	0	**4**	**10.0%**
Head-On	2	2	0	**4**	**10.0%**
Other	1	0	1	**2**	**5.0%**
Angle	0	0	0	**0**	**0.0%**
Left-Turn	0	0	0	**0**	**0.0%**
Non-Contact (non-motorcycle)	0	0	0	**0**	**0.0%**
Sideswipe (opposite direction)	0	0	0	**0**	**0.0%**
U-Turn	0	0	0	**0**	**0.0%**
Total	**21**	**10**	**9**	**40**	**100.0%**

Data from February 1, 2003 to January 31, 2006.
Source: ADOT Traffic Records Branch

As shown in **Table 2-11**, Collision Manner Summary, 19 (47.5 percent) of the 40 collisions were single vehicle type collisions and 11 (27.5 percent) were rear-end crashes. These two collision types account for 75 percent of the total collisions/crashes along this 6-mile section of I-40 during this time period. Summaries of the collision severity are shown in **Table 2-12** below.

Table 2-12 Collision Severity Summary

Year	Total Collisions	Number of		
		Vehicles	Injuries	Fatalities
2003	21	36	16	4
2004	10	14	5	0
2005	9	11	10	0
Total	**40**	**61**	**31**	**4**

Data from February 1, 2003 to January 31, 2006.
Source: ADOT Traffic Records Branch

A total of 61 vehicles were involved in the 40 collisions along I-40 from February 1, 2003 to January 31, 2006. A total of 4 fatalities and 31 injuries occurred during this same time period.

2.7 TRAFFIC STUDY RECOMMENDATIONS/CONCLUSIONS

2.7.1 Mohave Drive

Recommended intersection configurations and number of through lanes were based on the Synchro 6 LOS analysis presented in **Section 2.5** and the requirement that intersections function at a LOS of D or better in the design year of 2030. The analysis indicated that Mohave Drive would require six lanes between the Rattlesnake Wash TI and the access to the Industrial Airpark (TAZ 80) near Gordon Drive. Between the Rattlesnake Wash TI and Louise Avenue, a four-lane section on Mohave Drive is adequate. The number of through lanes required for Mohave Drive is shown in **Figure 2-14**, along with assumed laneage for network roads.

The intersection configurations on Mohave Drive are very similar between the two Build scenarios and are shown on **Figure 2-15** and **Figure 2-16**. The number of through lanes for both scenarios does not change, except for in the northbound direction on the Rattlesnake Wash TI bridge. In *Scenario 2 – Rattlesnake Wash TI*, the third northbound through lane will be required on the bridge to accommodate the large volume from the eastbound off-ramp that wants to travel northbound. In *Scenario 3 – Full Build*, the third northbound through lane will not be required until just north of the Rattlesnake Wash TI.

Figure 2-15 shows the recommended intersection configurations to be used for this project for *Scenario 2 – Rattlesnake Wash TI*. If the Kingman Crossing TI project is approved for construction, then the intersection configuration for *Scenario 3 – Full Build* as shown in **Figure 2-16** can be used. Under both scenarios, all intersections on Mohave Drive operate at LOS D or better.

At the Rattlesnake Wash TI, two left-turn lanes are recommended due to the large southbound left-turn volume. Typically, left-turning movement volumes that exceed 300 vehicles per hour warrant an additional lane. In some cases, double left-turn lanes are warranted based on the operation of critical movements within the intersection, and assignment of green time[2]. Double left-turn lanes are being recommended in order to add signal timing flexibility to the design.

The southbound left-turn volume is largely based on the predicted growth in traffic to and from the east of Kingman, coded in the model as the external TAZ 97. This zone is coded with over 11,000 population and over 12,100 employment. These socioeconomic data generate over 11,000 daily trips which are then added to 10,500 “external” trips that travel on I-40 through the Kingman area. The model is showing that a fair amount of traffic is using the east side ramps. In *Scenario 2 – Rattlesnake Wash TI*, the east side ramps have about one-third as much traffic as the west side. In *Scenario 3 – Full Build*, the east side ramps have about half the traffic as the west side.

[2] By increasing the capacity of one movement, the capacity of another movement is increased because there is more available green time for that movement within the cycle.

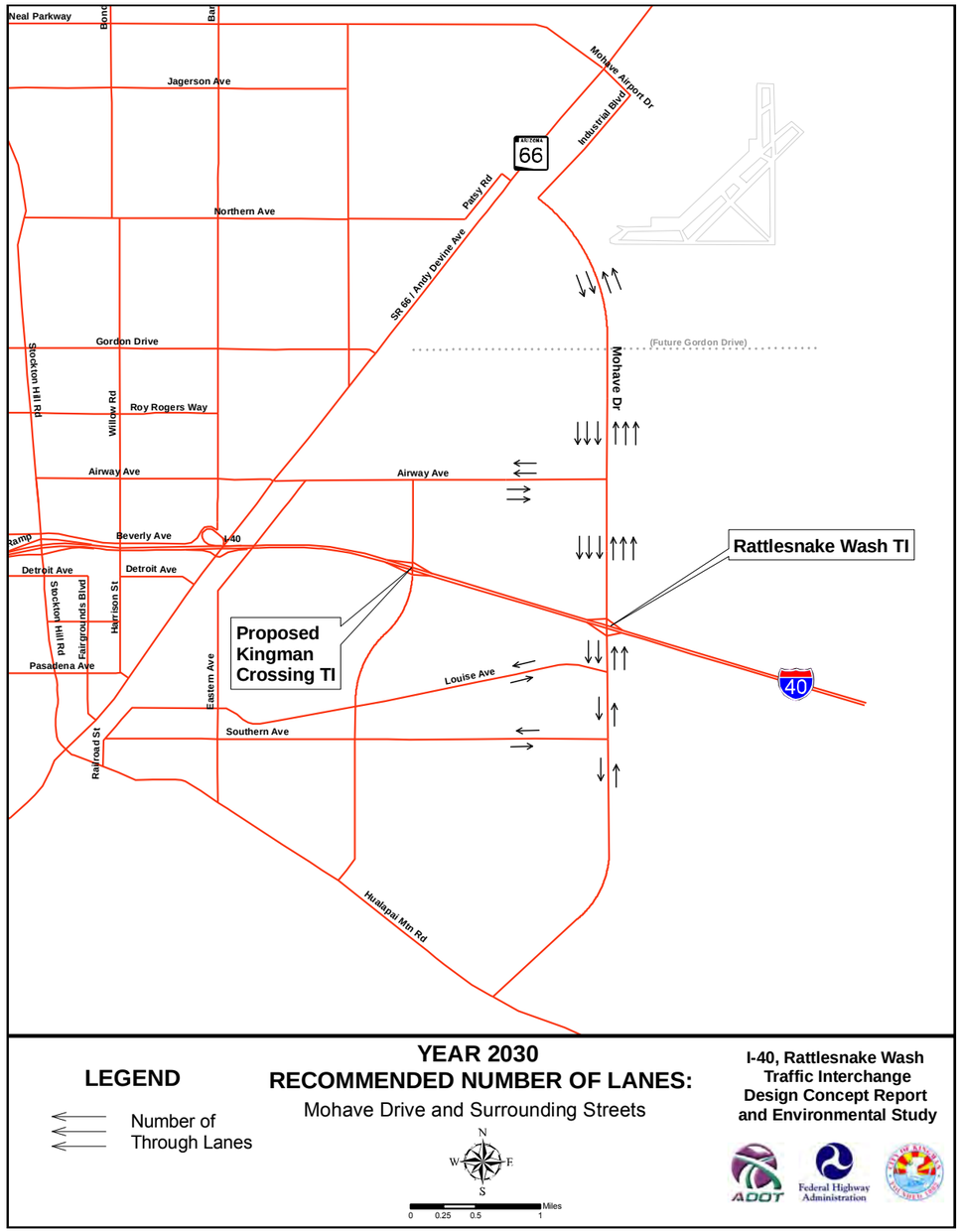

Figure 2-14 Year 2030 Recommended Number of Lanes: Mohave Drive and Surrounding Streets

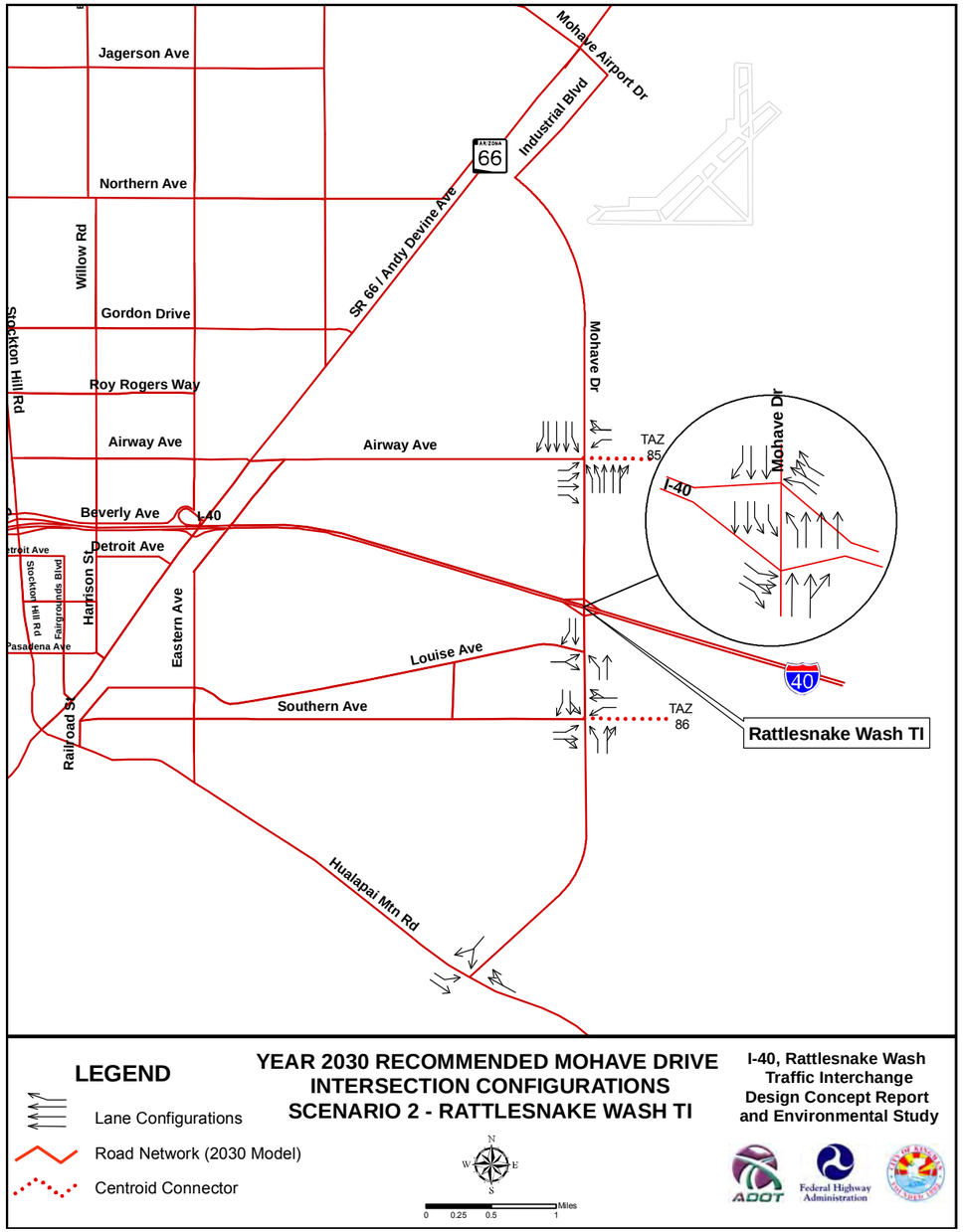

Figure 2-15 Year 2030 Recommended Mohave Drive Intersection Configurations: Scenario 2 – Rattlesnake Wash TI

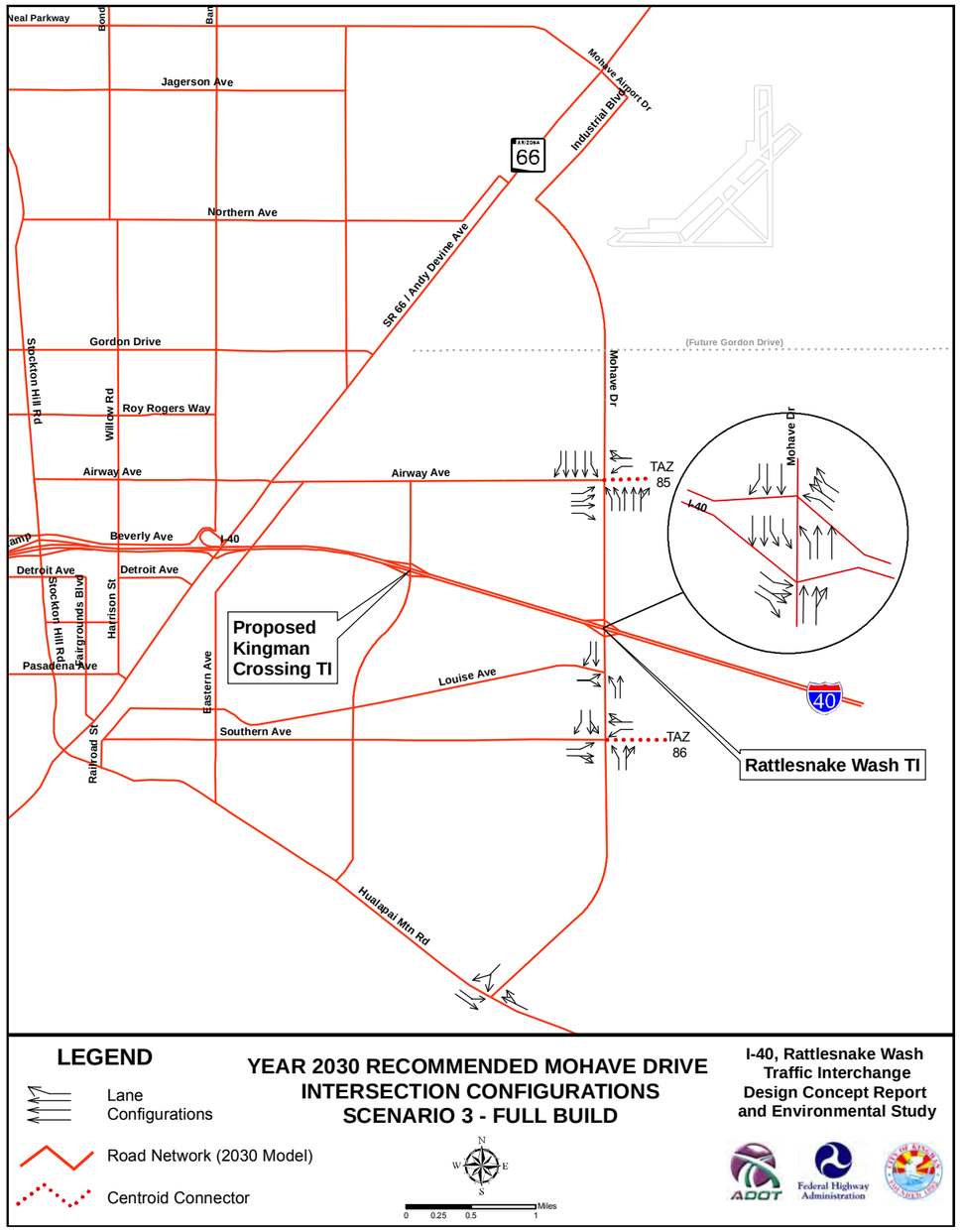

Figure 2-16 Year 2030 Recommended Mohave Drive Intersection Configurations: Scenario 3 – Full Build

2.7.2 Rattlesnake Wash Traffic Interchange

The target LOS for Year 2030 design was LOS D.

The following items summarize the results and recommendations for *Scenario 2 – Rattlesnake Wash TI*:

- The Rattlesnake Wash TI will perform adequately as a compact diamond interchange.
- All approaches operated as LOS D or better.
- Mohave Drive between the ramp intersections will require two through lanes and two left-turn lanes southbound, and three through lanes with one left-turn lane northbound.

The results would be the same for *Scenario 3 – Full Build*, except that only two through lanes with one turn left-lane northbound would be required on Mohave Drive between the ramp intersections

The length of the turn bays on the Rattlesnake Wash TI and at the intersection of Mohave Drive and Airway Avenue were estimated based on the length of the 95th percentile queue in Synchro. **Table 2-13** shows the recommended turn bay lengths for the Rattlesnake Wash TI.

Table 2-14 shows the recommended turn bay lengths for the intersection of Mohave Drive and Airway Avenue.

Table 2-13 Recommended Turn Bay Lengths for the Rattlesnake Wash TI

Movement	Peak Hour Volume (vph)	Recommended Length (ft)
Scenario 2 – Rattlesnake Wash TI		
NBL	225	150
SBL	600	350
EBL (ramp)	1,400	700
WBT/R (ramp)	525	475
Scenario 3 – Full Build		
NBL	175	150
SBL	450	225
EBL (ramp)	750	325
WBT/R (ramp)	400	150

Table 2-14 Recommended Turn Bay Lengths for Airway Avenue and Mohave Drive Intersection

Movement	Peak Hour Volume (vph)	Recommended Length (ft)
Scenario 2 –Rattlesnake Wash TI		
EBL	675	300
EBR	800	350
WBL	100	125
NBL	800	350
SBL	100	100
SBR	775	200
Scenario 3 – Full Build		
EBL	775	350
EBR	475	200
WBL	100	100
NBL	475	125
SBL	125	125
SBR	775	100

2.7.3 I-40 Freeway

Freeway LOS was analyzed in HCS+ based on the peak hour segment volumes developed from the model and assumed directional splits. In both scenarios, the model showed large numbers of vehicles entering and exiting on the east side at the East Kingman (Andy Devine) TI, indicating I-40 will be used for both local and regional access. The number of lanes required in both scenarios is shown in **Figure 2-17**.

For this project, *Scenario 2 – Rattlesnake Wash TI*, there is a significant travel demand on I-40 for the west side of the Rattlesnake Wash TI. The amount of traffic entering and exiting at the west side ramps is greater than the mainline volume to the east of these ramps. Because of this large volume increase, the freeway segment to the west of the Rattlesnake Wash TI will operate at LOS D. In order to maintain a minimum LOS C for this segment, an auxiliary lane or a third through lane will be required in both directions, connecting the Rattlesnake Wash TI ramps to the East Kingman TI ramps. The expected year in which these auxiliary lanes or a third through lane will be required is 2027.

The proposed Kingman Crossing TI in *Scenario 3 – Full Build* is currently under study and may be constructed prior to the construction of the Rattlesnake Wash TI. In this scenario, there is increased travel demand on I-40 between the Kingman Crossing TI and the Rattlesnake Wash TI. In spite of this volume increase, the freeway segment between the Kingman Crossing TI and the Rattlesnake Wash TI will operate at LOS C. At this point, no improvements are recommended for I-40 under the *Scenario 3 – Full Build* scenario for the segment between the Kingman Crossing TI and the Rattlesnake Wash TI.

However, FHWA has recommended that an auxiliary lane between Rattlesnake Wash TI and the Kingman Crossing TI be included as part of this project to further counteract the merge, diverging, and weaving interference between the Rattlesnake Wash TI and the Kingman Crossing TI. Since it is unknown which TI will be constructed first, the Rattlesnake Wash TI should include elongated parallel entrance and exit ramps that will extend west halfway to the termini of the proposed Kingman Crossing east side entrance and exit ramps. This will effectively lay the groundwork for the auxiliary lanes between the Rattlesnake Wash TI and the Kingman Crossing TI; this will allow for a seamless connection during construction of the Kingman Crossing east side ramps. If the Kingman Crossing TI will not be constructed, the Rattlesnake Wash TI west side entrance and exit ramps should be constructed as standard parallel type ramps.

However, there is a significant travel demand on I-40 between the East Kingman TI and the Kingman Crossing TI. By year 2025, an additional auxiliary lane providing a ramp-to-ramp connection or a third through lane will be required on I-40 in both directions between the East Kingman TI and the Kingman Crossing TI. Without the addition of the auxiliary lanes or third through lanes, westbound and eastbound I-40 is expected to operate at LOS D, degrading to LOS E by 2028. With these improvements, the freeway segment is expected to operate at LOS C.

In *Scenario 3 – Full Build*, For the 2030 condition, the eastbound freeway segment between the East Kingman TI and the Stockton Hill TI is expected to experience LOS D. The threshold LOS D operation is projected to occur in the year 2029. In order to maintain LOS C, this portion of I-40 will need to be widened to three lanes in both directions. ADOT and FHWA have agreed that ADOT will evaluate the need for auxiliary lanes between the East Kingman TI and the Kingman Crossing TI when scoping is conducted on the future project to widen I-40 to three lanes, which is based on the MoveAZ 20-year long-range transportation plan that calls for I-40 to be widened to three lanes in each direction.

The section of I-40 between Rattlesnake Wash TI and the DW Ranch Road TI will operate at LOS B and C at the 2030 design year for both Build scenarios, and will not require any improvements.

2.7.4 Interim Year 2012 Design Recommendations

Figure 2-18 shows the recommended number of lanes for the Interim Year 2012 outside of the TI ramp limits.

One lane in each direction on Mohave Drive should be sufficient in 2012, with the highest segment estimated daily volume of 9,400 vehicles per day. This analysis assumes that TAZ 80 (the airport and industrial park) has about 33 percent of its full development in 2012. Left-turn lanes will be required at the intersection with Airway Avenue.

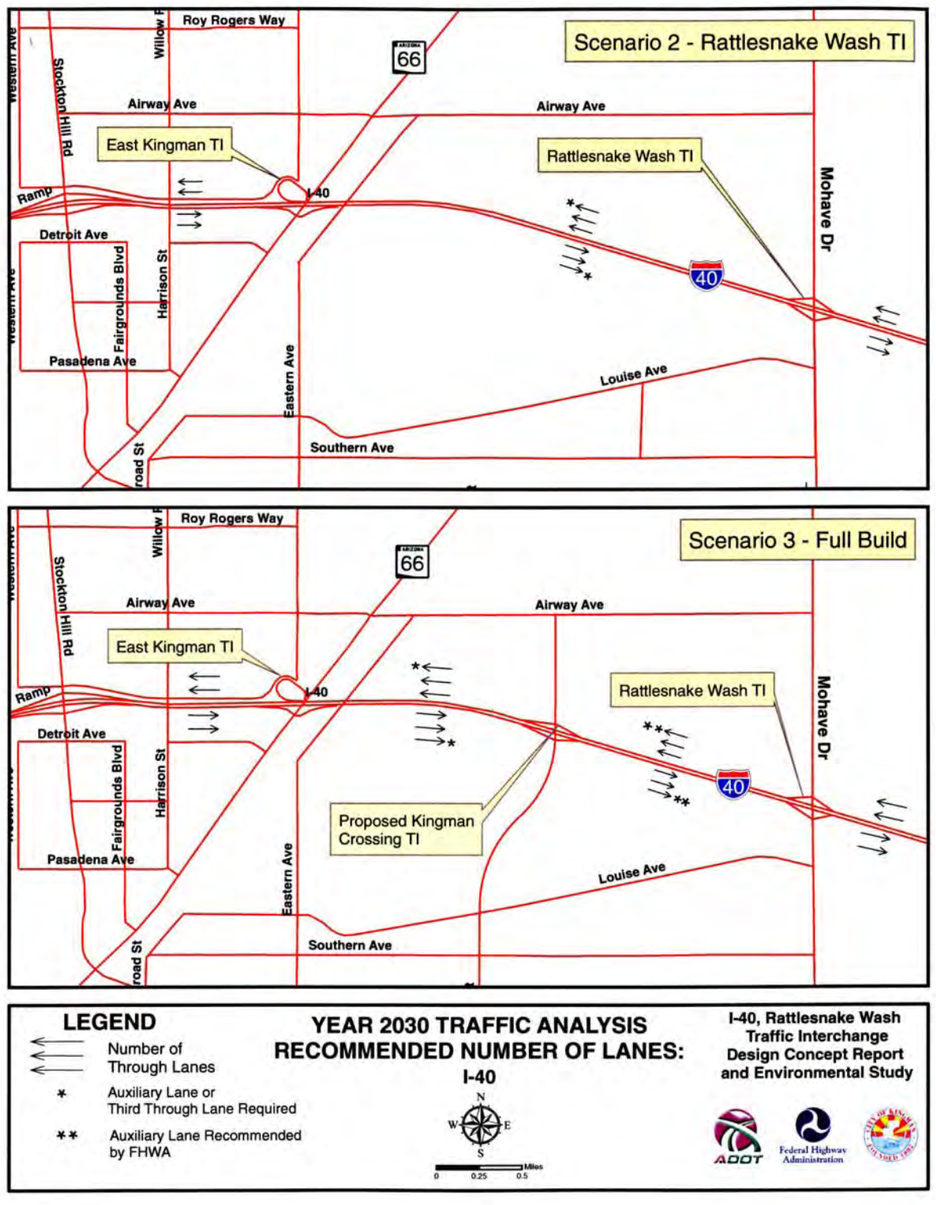

Figure 2-17 Year 2030 Recommended Number of Lanes: I-40

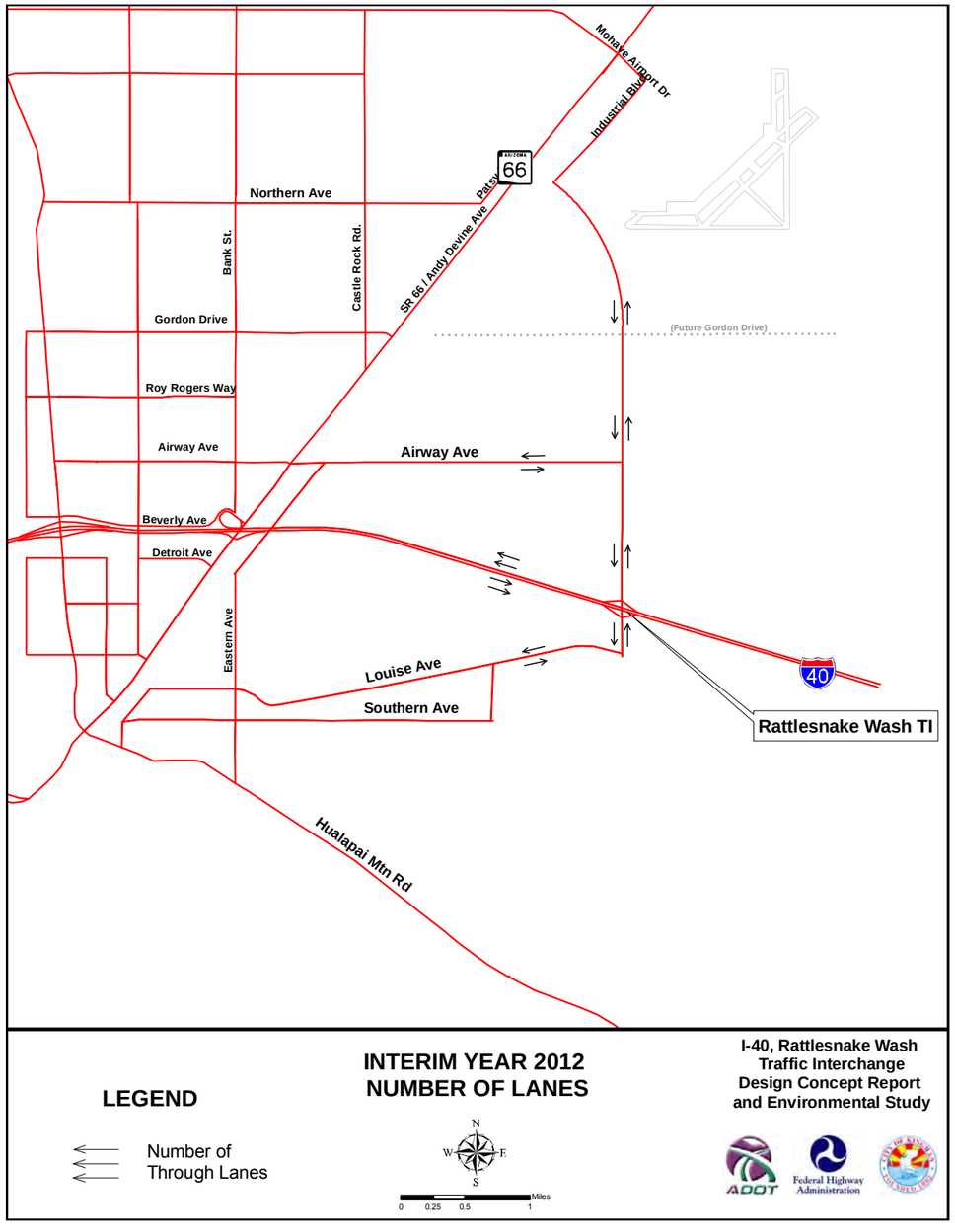

Figure 2-18 Interim Year 2012 Number of Lanes

3.0 DESIGN CONCEPT ALTERNATIVES

3.1 INTRODUCTION

Four interchange types were considered to provide access to I-40 from the new Mohave Drive: a spread diamond, single-point urban (SPUI), partial cloverleaf, and compact diamond interchange. In addition to the interchange type, the stacking order is also being considered. I-40 will remain at its current grade, and the crossroad would be elevated over or depressed under the freeway.

Several corridor alternatives were considered for the location of Mohave Drive between Hualapai Mountain Road and Industrial Boulevard for Phase 1 and Phase 2 improvements as shown in **Figure 3-1**. For Phase 1 between Louise Avenue and Industrial Boulevard, there are three corridor alternatives were considered, Alternatives N1, N2, and N3. For Phase 2 between Hualapai Mountain Road and Louise Avenue, four conceptual corridor alternatives were considered: Alternatives S1, S2, S3, and S4.

The following sections describe the interchange and corridor alternatives that have been considered. The interchange and corridor alternatives were initially screened to reduce the alternatives down to most feasible. The remaining alternatives were then developed further in greater detail and evaluated more definitively, resulting in a recommended alternative to be developed further in final design.

3.2 INITIAL SCREENING OF ALTERNATIVES

3.2.1 Interchange Design Concept Alternatives Considered and Eliminated from Further Consideration

No-Build Alternative

The no-build alternative would not construct any portion of the TI. It is recommended that this alternative be eliminated from further consideration. The alternative is not feasible because it would not provide access to I-40 from the rapidly growing East Kingman area.

Spread Diamond Interchange

The spread diamond alternative would have ramp intersections approximately 800 feet apart. These signalized intersections would limit the locations of adjacent signalized intersections and would have a greater restriction on access to future development to the lands adjacent to the traffic interchange. The spread diamond alternative would require the most right-of-way. The spread diamond TI would be more expensive to construct due to much longer ramps, increased earthwork volumes, separate new ramp bridges over Rattlesnake Wash, and a larger storm drain system will be needed. A spread diamond TI would further reduce the distance between adjacent intersections below the desired minimum access control distance of 1,320 feet from the TI. For these reasons, it is recommended that the spread diamond be eliminated from consideration.

Single-Point Urban Interchange

A SPUI would have the ramp alignments in close proximity to the mainline, requiring retaining walls and a more complex cast-in-place bridge structure. A SPUI would require less right-of-way than the spread diamond but would cost significantly more to construct. A SPUI underpass alternative would require a more complex cast-in-place bridge structure and will require falsework over I-40, which is not desirable. In addition, the profile will need to be raised farther to account for falsework clearance, which will require significantly more embankment material. A SPUI overpass alternative will require much longer bridges on I-40 to span the large area a SPUI requires and would require significantly more excavation to lower the crossroad grade. Due to the higher cost for structures and earthwork, it is recommended that this alternative be eliminated from consideration.

Partial Cloverleaf Interchange

A partial cloverleaf interchange (PARCLO) would include two loop ramps to provide access to I-40. The two loop ramps would likely be used as the entrance ramps. This is safer than using loops on the exit ramps because traffic will not have to decelerate from freeway speeds to maneuver the loops. The exit ramps would be similar to those in the spread diamond alternative. PARCLOs can be useful for situations where constraints make some ramp locations less feasible. However, they are less intuitive for drivers and the loops would require additional right-of-way and longer bridge span lengths. In addition, ADOT does not find PARCLOs to be desirable under normal conditions. It is recommended that this alternative be eliminated from consideration.

Non-Skewed Interchange

The alignment of the Mohave Drive Section Line crosses I-40 at a skew of approximately 16.5 degrees. An alternative to remove this skew would have Mohave Drive curve slightly to the east near Louise Avenue, cross I-40 with no skew and then curve west to the section line. This would result in slightly shorter structure lengths at I-40, but would require significant amounts of additional right-of-way. The ADOT *Roadway Design Guidelines* do not specify a limit for the amount of skew in this situation. The applicable requirement is that the ramp alignments must intersect the crossroad alignment at an angle of 15 degrees or less. This requirement can be met with Mohave Drive parallel to the section line. Due to the additional right-of-way that would be required, it is recommended that this alternative be eliminated from consideration.

3.2.2 Interchange Design Concept Alternatives to be Studied

It is recommended that two interchange configurations be studied as part of the DCR. Both configurations are compact diamonds with either an underpass or overpass structure. The underpass alternative would have the crossroad elevated over I-40, and the overpass alternative would have the crossroad depressed under I-40 without changing the grade on I-40. Both of these alternatives would have the ramp intersections spread apart by approximately 430 feet. The compact diamond would cost less than the SPUI, require less right-of-way than the spread diamond or PARCLO, and is more intuitive to drivers. Both alternatives would utilize parallel type exit and entrance ramps.

Compact Diamond Overpass Interchange Alternative

The Overpass alternative would have Mohave Drive depressed under I-40 with two new parallel bridges constructed to carry I-40 over the crossroad. Drainage is always an issue when depressing a roadway. The depressed area can be gravity-drained due to I-40 being slightly above existing grade in this area, and the terrain sloping down to the north at approximately 3.8 percent. Maintaining traffic on I-40 while constructing the new bridges over the crossroad may require using the ramps to detour traffic. An advantage of this alternative would be the earthwork generated by depressing Mohave Drive. This material will be used as embankment for Mohave Drive. This alternative would also generate less noise and have less visual impact to the surrounding area.

Compact Diamond Underpass Interchange Alternative

This alternative would have Mohave Drive elevated over I-40 with a single new bridge constructed to carry the crossroad over the freeway. This alternative would have fewer drainage and constructability challenges, but would require a significant amount of borrow material to construct the roadway embankment. This alternative would also generate more noise and have greater visual impacts.

3.2.3 Mohave Drive Corridor Alternatives Considered and Eliminated from Further Consideration

Several corridor alternatives are under consideration for the location of Mohave Drive between Hualapai Mountain Road and Industrial Boulevard for Phase 1 and Phase 2 improvements as shown in **Figure 3-1**.

Phase 1 – Two of the Phase 1 corridor alternatives, N1 and N3, have been eliminated from further consideration. Alternative N1 would have Mohave Drive curve onto the Gordon Drive alignment and extend west to intersect an extension of Industrial Parkway. This alignment would create more out of direction travel and would require an additional large drainage crossing of Rattlesnake Wash. The second corridor north of Gordon Drive, Alternative N3, would have Mohave Drive extend around the east side of the airport creating a ring road. This alternative would be much longer and out of direction, and therefore much more expensive. In addition, Alternatives N1 and N3 are not consistent with the COK General Plan and the KATS. Alternative N2 was retained for further study.

Phase 2 – South of Louise Avenue, corridor Alternative S1 has been eliminated from further consideration. Alternative S1 would have Mohave Drive on the section line between Louise Avenue and Southern Avenue. South of Southern Avenue, the alignment would curve to the southwest and traverse across the middle of Section 27 to an intersection with Hualapai Mountain Road. A single private landowner owns Section 27, and this alternative would split his land into two pieces and may limit potential future development opportunities. Alternatives S2, S3, and S4 were retained for further study.

3.2.4 Mohave Drive Corridor Alternatives to be Studied

Phase 1 – The alignment of Alternative N2 generally follows the section line between Louise Avenue and Gordon Drive. North of Gordon Drive, Alternative N2 curves to the northwest and parallels an existing gas line to an intersection with Industrial Parkway. The Kingman Airport Authority has agreed to this corridor, and the FAA has completed an airspace study in order to release the airport property for the new Mohave Drive right-of-way from aeronautical use to non-aeronautical use. This alternative provides the most direct route and would not have a second crossing of Rattlesnake Wash.

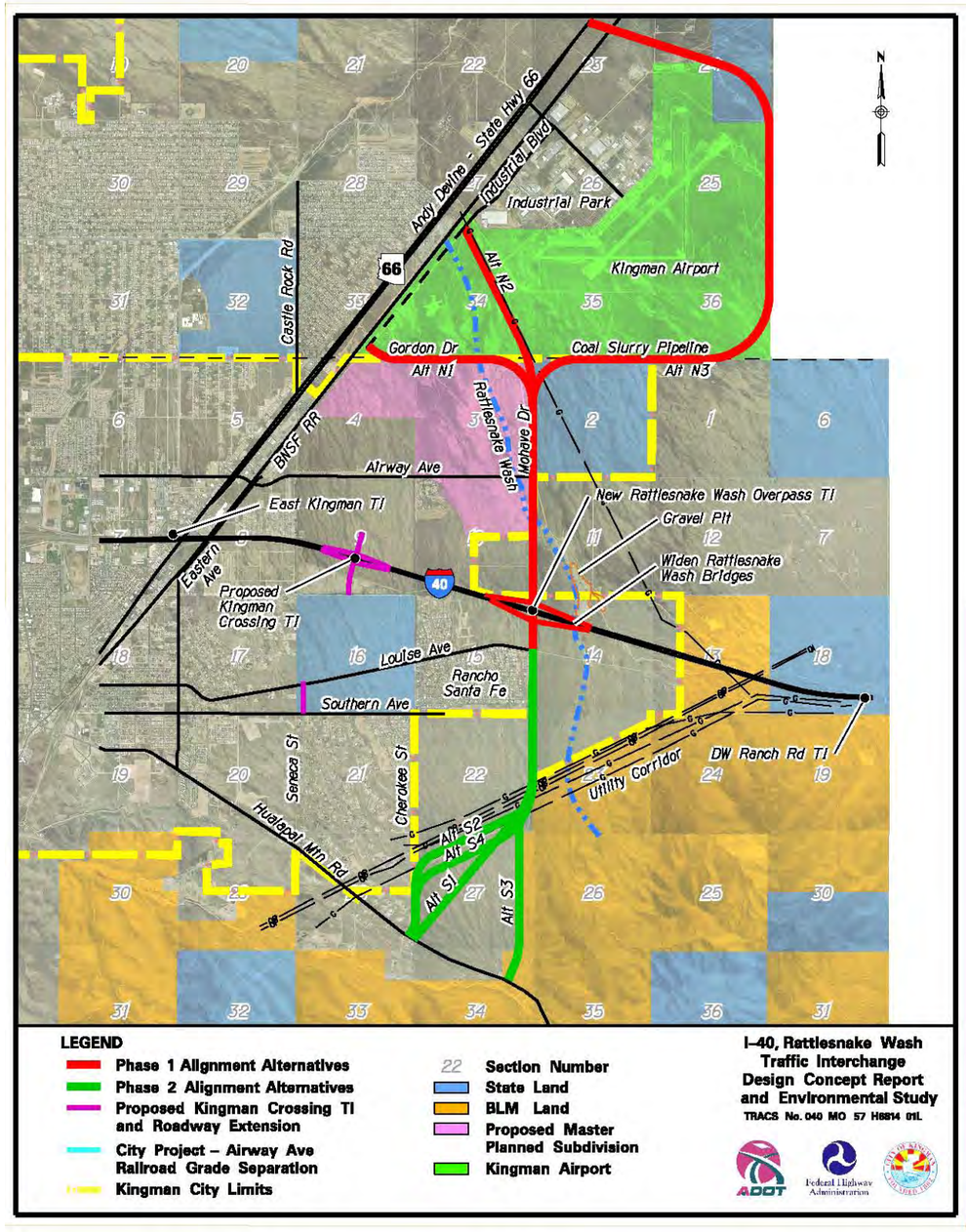

Figure 3-1 Mohave Drive Corridor Alternatives

Phase 2 – South of Louise Avenue, three corridor alternatives were considered and evaluated. All three alternatives share the same section line alignment between Louise Avenue and the utility corridor. South of the utility corridor the alternative alignments diverge. Alternative S2 would curve to the southwest and travel within the utility corridor to the west side of Section 27 where it would then curve south and intersect Hualapai Mountain Road. Alternative S4 is similar to S2, but would parallel the south side of the utility corridor. A 400-foot wide buffer would be left between the new right-of-way and the gas line easement to allow for potential development. The private landowner has stated willingness to donate the right-of-way for either Alternative S2 or S4. Alternative S3 would keep Mohave Drive on or near the section line and cross BLM land just inside the BLM boundary before intersecting Hualapai Mountain Road. The BLM has indicated that they would consider this alternative.

3.3 EVALUATION OF SELECTED ALTERNATIVES

Each of the traffic interchange alternatives and Phase 1 Mohave Drive alternatives carried forward from the initial screening were developed geometrically using the ADOT *Roadway Design Guidelines*. The alternatives were developed to a sufficient detail with preliminary horizontal and vertical geometry to determine major design features and to provide a basis for comparative cost estimating. The Phase 2 Mohave Drive alternatives carried forward from the initial screening were developed to a lesser level of detail, but sufficient detail to determine feasibility and to provide a basis for comparative cost estimating.

3.3.1 Evaluation of the Traffic Interchange Alternatives

An evaluation was made of each of the traffic interchange alternatives based on the ICOs and evaluation factors. A summary of the traffic interchange alternatives evaluation is presented in **Table 3-1**.

Table 3-1 Traffic Interchange Evaluation Matrix

Evaluation Criteria	I-40 Underpass Alternative Mohave Drive Elevated	I-40 Overpass Alternative Mohave Drive Depressed
Construction Costs	• $28.4 million (for TI improvements within the access control limits).	• $24.3 million (for TI improvements within the access control limits).
Roadway Geometry & Safety	• Adequate roadway geometry is provided. • Meets ADOT Design Criteria.	• Adequate roadway geometry is provided. • Meets ADOT Design Criteria.
Traffic Operational Impacts	• TI improvements provide a LOS D on I-40 and LOS B and C on the TI Ramps for the Design Year 2030.	• TI improvements provide a LOS D on I-40 and LOS B and C on the TI Ramps for the Design Year 2030.
Right-of-Way	• The adjacent landowner is dedicating 34.2 acres to the TI. The majority of the TI improvements remains within the dedicated right-of-way, but an additional 1.0 acre will need to be dedicated on the north side along Mohave drive to the north boundary line of Section 14. • Approximately 9.1 acres of right-of-way is required along Mohave drive from north boundary line of Section 14 to Grand Canyon Road. The City of Kingman will acquire the right-of-way.	• The adjacent landowner is dedicating 34.2 acres to the TI. All of the TI improvements stay within the dedicated right-of-way. • Approximately 5.2 acres of right-of-way is required along Mohave drive from the Section 14 line to Grand Canyon Road. The City of Kingman will acquire the right-of-way.
Earthwork	• Requires 782,000 CY of borrow material to construct the embankment to the TI. • Will require long hauls from borrow pits that are as far as 20 miles away depending on the quantity and suitability of borrow material available.	• Requires 425,000 CY of excavation to construct the TI. • A portion of the excess material can be used in the construction of Mohave Drive north of the TI. • Potential waste sites include the existing gravel pit nearby along Rattlesnake Wash and the old ADOT borrow pits on City of Kingman land near the proposed Kingman Crossing TI.
Drainage	• TI and ramp improvements impact nine culverts along I-40 that will need to be extended. • Minimal impacts to existing drainage patterns. • Requires a less extensive storm drain system.	• TI and ramp improvements impact nine culverts along I-40. • Flow to four of the culverts will need to be rerouted through the depressed TI section to maintain existing drainage patterns. This will require 2,000 feet of a large diameter storm drain to intercept flow from the four culverts and route the flow under Mohave Drive through the depressed section under I-40. • Requires a more extensive storm drain system.
Structures	• The Mohave Drive underpass structure will have a two-span precast-prestressed AASHTO Type VI I-girder superstructure with 130-foot span lengths and a total bridge length of 266 feet. The out-to-out structure width will be 121'-0". Abutment substructures will consist of drilled shaft foundations supporting concrete columns and seat-type abutments. • Total area for the new bridge = 32,186 square feet. • The existing Rattlesnake Wash EB Bridge will be widened to the outside approximately 14 feet to accommodate the ramp departure for the EB on-ramp.	• The I-40 EB and WB overpasses will consist of two single-span cast-in-place and post-tensioned concrete box girder superstructures with a total span length of 186 feet. The out-to-out width of each structure will be 60'-10" consisting of three lanes of traffic, a 10'-0" inside shoulder and a 12'-0" outside shoulder. • Total area for both new bridges = 23,374 square feet. • The existing Rattlesnake Wash EB and WB Bridges will be widened to the outside to accommodate the ramp approach for the WB off-ramp and the ramp departure for the EB on-ramp. In the westward direction near the exit gore, the widening of the EB Bridge will vary approximately 20-30 feet and the WB Bridge will be widened approximately 14 feet.
Impacts to I-40	• Traffic can be maintained on I-40 with minimal closures. • Nighttime closures of I-40 will be required to place the bridge girders. All four ramps will be used as temporary detours and will need to be constructed before placing the bridge girders. Temporary widening of the ramps will not be necessary because only one lane is necessary during nighttime closures due to lower traffic volumes at night.	• Given that the new EB and WB I-40 overpasses will be constructed at-grade on the existing alignments, temporary detours will be required during construction. • All four ramps will be used as temporary detours and will need to be constructed before constructing the EB and WB overpass structures.
Utilities	• Will require the relocation of the TI carrier line located along the existing north I-40 right-of-way line.	• Will require the relocation of the TI carrier line located along the existing north I-40 right-of-way line.
Environmental Considerations	• No known adverse impacts.	• No known adverse impacts.

Based on above evaluation, the **Overpass Alternative is recommended for further development**. The Overpass Alternative offers the following advantages:

- **Construction Costs** – The Overpass Alternative is 15 percent less expensive to construct than the Underpass Alternative ($24.3 million vs. $28.4 million). The main cost differentiating items are earthwork, drainage culverts and storm drain, and structures.
- **Right-of-way** – The Overpass Alternative requires the least amount of right-of-way, 39.4 acres vs. 44.3 acres for the Underpass Alternative.
- **Earthwork** – The Overpass Alternative requires 425,000 cubic yards of excavation to construct the depress roadway and ramps, whereas the Underpass Alternative requires 782,000 cubic yards of borrow material to construct the roadway embankment, which will need to be hauled in from material pits from as far as 20 miles. This is the main cost differentiating factor between the two alternatives.

The disadvantages of the Overpass Alternative would include a more extensive storm drain system to be constructed and maintained, and it will require long-term detours on I-40 which will have minor disruption to traffic.

3.3.2 Evaluation of the Mohave Drive Alternatives

Phase 1 – Based on initial evaluation made in Section 3.2.4, Alternative N2 is the only remaining alternative to be considered. Therefore, **Alternative N2 is recommended for further development.**

Phase 2 – A feasibility evaluation was made of each of the Phase 2 Mohave Drive corridor alternatives, and is presented in **Table 3-2**.

Table 3-2 Phase 2 Mohave Drive Evaluation Matrix

Evaluation Criteria	Mohave Drive Alternative S2	Mohave Drive Alternative S3	Mohave Drive Alternative S4
Construction Costs	• $10.5 million • Major cost items include pavement, median curb, earthwork, and drainage.	• $9.2 million • Major cost items include pavement, median curb, and earthwork. • Will require addition cost to improve Hualapai Mountain Road between S2/S4 and S3 due to the planned widening of Hualapai Mountain Road to Mohave Drive.	• $10.5 million • Major cost items include pavement, median curb, earthwork, and drainage.
Roadway Geometry & Safety	• Meets COK and AASHTO Design Criteria. • Total length of new roadway = 3.0 miles.	• Meets COK and AASHTO Design Criteria. • Total length of new roadway = 2.8 miles • Add 0.6 miles of out of direction travel	• Meets COK and AASHTO Design Criteria. • Total length of new roadway = 3.0 miles
Drainage	• 16 cross drainage culverts will be required ranging in size from 24" CMPs to 60" CMPs including a 8'x4' box culvert and a 10'x4' box culvert.	• 2 cross drainage culverts will be required, one 24" CMP and one 60" CMP.	• 16 cross drainage culverts will be required ranging in size from 24" CMPs to 60" CMPs including a 8'x4' box culvert and a 10'x4' box culvert.
Traffic Operational Impacts	• Two–lane roadway will provide adequate capacity up to year 2030. • Reduces out of direction travel by 3/4-mile when compared to Alternative S3.	• Two–lane roadway will provide adequate capacity up to year 2030. • Increases out of direction travel by 3/4-mile when compared to Alternatives S2 and S4.	• Two–lane roadway will provide adequate capacity up to year 2030. • Reduces out of direction travel by 3/4-mile when compared to Alternative S3.
Right-of-Way	• Approximately 40.6 acres of new right-of-way would be required along Mohave drive from the Hualapai Mountain Road to Louise Avenue line to Grand Canyon Road. • The landowner of Section 27 has indicated that he would dedicate approximately 18.8 acres of new right-of-way across his property to the COK for Alternative S2. This would result in COK acquiring the remaining 21.8 acres north of Section 27 to Louise Avenue. • Section 27 landowner prefers this alternative to Alternatives S3 and S4.	• Approximately 39.7 acres of new right-of-way would be required along Mohave drive from the Hualapai Mountain Road to Louise Avenue line to Grand Canyon Road. • Approximately 20.1 acres of new right-of-way is required for the section of Mohave Drive that crosses through BLM lands in Section 27. • The remaining 19.6 acres would need to be acquired by COK.	• Approximately 40.6 acres of new right-of-way would be required along Mohave drive from the Hualapai Mountain Road to Louise Avenue line to Grand Canyon Road. • The landowner of Section 27 has indicated that he would dedicate approximately 18.8 acres of new right-of-way across his property to the COK for Alternative S4. This would result in COK acquiring the remaining 21.8 acres north of Section 27 to Louise Avenue.
Earthwork	• The excavation volume will be significantly greater than that of Alternative S3. This is due to the road crossing through many ridgelines and drainages at the southern end in Section 27.	• The excavation volume will be significantly less than that of Alternatives S2 and S3. The road alignment for Alternative S3 mostly follows a ridgeline, which would require a minimal amount of excavation.	• The excavation volume will be significantly greater than that of Alternative S3. This is due to the road crossing through many ridgelines and drainages at the southern end in Section 27.
Utilities	• Crosses through the utility corridor. No utility conflict. • A portion of the road alignment runs inside utility corridor which may limit future utilities to use the corridor.	• Crosses through the utility corridor. No utility conflict.	• Crosses through the utility corridor. No utility conflict.

Based on the above evaluation, **Alternative S4 is recommend to be chosen for further development**. Alternative S4 offers the following advantages:

- **Construction Costs** – Alternative S4 and S2 have similar Construction costs, but are both more expensive to construct than Alternatives S3. However, the city plans to improve and widen Hualapai Mountain Road to four lanes to the intersection of Mohave Drive. Alternative S3 will require an

additional 0.8 miles of widening of Hualapai Mountain Road. This will increase the overall cost for Alternative S3 by approximately $3 million to $12.2 million, which is higher than construction cost for Alternative S4 ($10.5 million).

- **Roadway Geometry** – Alternative S3 adds ¾ - mile of out of direction travel, increasing travel time and vehicle operating costs. Alternative S4 is preferred by the Section 27 landowner and the City of Kingman.

- **Utilities** – A portion of Alternative S2 lies within the utility corridor, which may limit the use of the corridor for future utilities**.**

The only disadvantages of Alternative S4 would include slightly more right-of-way acquisition. The landowner for Section 27 (Scott Dunton) has tentatively agreed to dedicate right-of-way for the road across Section 27 along the Alternative S4 alignment.

4.0 MAJOR DESIGN FEATURES OF THE RECOMMENDED ALTERNATIVE

4.1 INTRODUCTION

This section describes the recommended design concept for Phase 1 improvements for a new traffic interchange on I-40 at MP 56.6, approximately 3 miles east of the existing I-40/State Route 66 (East Kingman) TI. The recommended design concept is based on the Traffic Study recommended improvements for the Full Build scenario. The project would also include the construction of a new arterial street along the proposed Mohave Drive alignment between Louise Avenue on the south and Industrial Boulevard near the Kingman Airport on the north. A total of approximately 3.7 miles of new roadway will be constructed.

The Phase 2 improvements for Mohave Drive are to be constructed by the COK and are included in this DCR for informational purposes only in support of the NEPA approval.

4.2 DESIGN CONTROLS

The new interchange will be designed to meet current ADOT, AASHTO and COK design criteria. The following design controls will be used for development of the alignment and layout of the recommended alternative.

Table 4-1 Design Controls

Description	Mohave Drive	I-40/Ramps
Design Year:	2030	2030
Design Vehicle:	WB-67	WB-67
Design Speed:	45 mph (ADOT & COK)	75 mph (I-40) 70 mph (Exit Ramp Gore) 65 mph (Entrance Ramp Gore) 50 mph (Ramp Body) 35 mph (Ramp Terminal)
Superelevation:	0.04 ft/ft max (ADOT)	0.06 ft/ft max
Maximum Horizontal Curve:	8°04' (within access control limits – ADOT) 1,040' (w/o super) (AASHTO)	2°18' (I-40) 6°53' (Ramps)
Maximum Gradient:	6.5% (within access control limits – ADOT) 6.0% (AASHTO)	3% (I-40) 4% upgrade, 5% downgrade (Ramps) 3% for 400 ft before traffic signals
Travel Lane Width:	12 ft	12 ft
Inside Shoulder Width:	2 ft (with median curb)	4 ft + 2 ft offset to barrier (I-40, 2-lane) 12 ft + 0 ft offset to barrier (I-40, 3-lane) 2 ft + 2 ft offset to barrier (On Ramp) 6 ft + 2 ft offset to barrier (Off Ramp)
Outside Shoulder Width:	4 ft (ADOT) 6.5 ft (COK)	10 ft + 2 ft offset to barrier (I-40, 2-lane) 12 ft + 0 ft offset to barrier (I-40, 3-lane) 2 ft + 2 ft offset to barrier (On Ramp) 10 ft (Off Ramp)
Normal Cross-Slope:	0.02 ft/ft	0.02 ft/ft
Vertical Clearance:	16.5 ft 16 ft to falsework over traffic	16.5 ft 16 ft to falsework over traffic
Type of Access Control:	Access control line is 1,320 ft beyond ramp pavement radius at the intersection of the ramp and crossroad.	Full access control (I-40 & Ramps)
Slope Standards:	3H:1V	4H:1V desirable (Ramp) 3H:1V max for landscaping (Ramp) Std C-2.10 (I-40)
Minimum Vertical Curve Length:	3 x design speed = 135 ft	200 ft (at Crossroad) 400 ft (Ramp Body)

4.3 HORIZONTAL AND VERTICAL ALIGNMENTS

Phase 1 will construct two new I-40 overpass structures with full access and arterial connections to Louise Avenue on the south side, and connections to both Airway Avenue and further north to Industrial Boulevard. Preliminary typical sections and plan and profile sheets were prepared for the recommended alternative and are shown in **Appendix A**.

The configuration of the new overpass traffic interchange will be a compact diamond interchange and will be comprised of standard one-lane entrance and exit ramps. Both entrance and exit ramps will be designed as parallel type ramps. The eastbound parallel entrance ramp acceleration lane will need to be extended from the minimum 700-foot length to 1,000 feet. This will provide adequate length for trucks to accelerate to speed after climbing up from the 4 percent upgrade on the ramp to the 1 percent upgrade on I-40. The parallel portion of the west side entrance and exit ramps will elongated and extended to the west halfway to the termini of the proposed Kingman Crossing east side entrance and exit ramps. This will effectively lay the groundwork for the auxiliary lanes between the Rattlesnake Wash TI and the proposed Kingman Crossing TI; this will allow for a seamless connection during construction of the proposed Kingman Crossing east side ramps. If the Kingman Crossing TI will not be constructed, the Rattlesnake Wash TI west side entrance and exit ramps should be constructed as standard parallel type ramps.

The entrance ramp will include two 12-foot lanes and 2-foot shoulders for a total width of 28 feet to the ramp gore area, then taper to one lane. The exit ramp will include one 12-foot lane with a 6-foot inside shoulder and a 10-foot outside shoulder for a total width of 28 feet to where the ramp tapers out for turn lanes near the intersection with Mohave Drive. The 28-foot ramp width is needed because the ramps may be used as two-lane detours to construct the I-40 overpass bridge structures (see Section 4.8).

The Mohave Drive cross road will depressed under I-40 with I-40 remaining at grade. Based on the traffic analysis recommendations, Mohave Drive between the ramp intersections will provide two through lanes and two left-turn lanes southbound, and three through lanes with one left-turn lane northbound.

Mohave Drive between Louise Avenue and the traffic interchange ramps would be constructed to provide two through lanes in each direction. Between the traffic interchange ramps and Airway Avenue, three through lanes in each direction would be constructed. North of Airway Avenue to Industrial Boulevard, an interim two-lane road (one-lane in each direction) with paved shoulders would be constructed in accordance with the LOI between ADOT and the COK. This section may be widened by the COK in the future as traffic volumes warrant. The Mohave Drive improvements will include curb and gutter and sidewalks between Louise Avenue and Airway Avenue to accommodate drainage and pedestrian traffic. The improvements will also include a 16-foot-wide raised median with concrete curb between Louise Avenue and Industrial Boulevard to aid in the control of access along Mohave Drive and to provide a greater separation between opposing traffic.

The existing I-40 typical section consists of two 12-foot lanes in each direction with 4-foot median shoulders and 10-foot outside shoulders. The two roadway centerlines are separated by 108 feet. The future ultimate I-40 typical section includes three 12-foot lanes in each direction with the additional lane to be added to the outside of the existing roadways. The ultimate section also includes 12-foot median and outside shoulders. The new overpass structures will be constructed to the ultimate section width.

The alignment of Mohave Drive generally follows the section line between Louise Avenue and Gordon Drive. North of Gordon Drive, Mohave Drive curves to the northwest and parallels an existing gas line to an intersection with Industrial Parkway.

Phase 2 Alternative S4 would construct a two-lane (one lane in each direction) arterial road from Hualapai Mountain Road to Louise Avenue. The two-lane road will provide adequate capacity for the 2030 design year. The improvements will include paved shoulders and a 16-foot-wide raised median with concrete curb to aid in the control of access along Mohave Drive and to provide a greater separation between opposing traffic. The alignment begins at the intersection of Hualapai Mountain Road just east of the west section line of Section 27, and then follows 480 feet east of the west section line of Section 27 to the utility corridor. The alignment then runs along the south side of the utility corridor and then curves north to generally follow the section line to Louise Avenue. The alignment was laid out to avoid the transmission towers in the utility corridor and to avoid impacting a COK water tank just north of the utility corridor. Preliminary typical section and plan and profile sheets were prepared for the recommended alternative and are shown in **Appendix B**.

4.4 ACCESS CONTROL

Access control along the crossroad is necessary to promote safe and efficient traffic operations in the proximity of the ramp intersection. On Mohave Drive, it is recommended that full access control be extended to Louise Avenue on the south and to the Grand Canyon Road alignment on the north. On the south side of the TI, the access control distance from the south ramp radius return to Louise Avenue would be approximately 1,350 feet. On the north side, the access control distance from the north ramp radius return to Grand Canyon Road would be approximately 1,600 feet. The ADOT access control limits would extend 300 feet from the ramp radius returns. **Figure 4-1** shows the proposed access control limits and ownership for this project.

An agreement between ADOT and the COK will be developed to include the limits of the ADOT maintenance within the access control limits and ownership. ADOT is currently developing an Access Control Model for Crossroads on Controlled Access Highways, which provides ADOT's desired access control criteria at interchanges. The guidelines state that ADOT will own the access control rights for a minimum distance of 300 feet beyond the radius return of the ramp terminals. Beyond this point, access control will need to be obtained, implemented, and preserved by local agencies with a written agreement and/or through the local agency permitting process.

4.5 RIGHT-OF-WAY

The majority of the land within the Phase 1 project limits is privately owned except for the section of land (Section 2) owned and managed by the ASLD, and the Kingman Airport, which is owned by the COK and managed by the Kingman Airport Authority.

The existing right-of-way width along I-40 is 308 feet within the project limits. There is some existing right-of-way along the Mohave Drive section line and is shown in **Figure 4-2**. In addition, there is a development agreement in place between the landowner adjacent to the TI and the COK to dedicate right-of-way for the new TI.

The proposed right-of-way for Mohave drive is 130 feet. In areas where the roadway fill or cut slopes extend outside the 130 right-of-way line, a slope easement will be required. Also, there are several locations where drainage easements will be required at culvert and roadside ditch locations. New right-of-way will be required for access roads to maintain access to property adjacent to Mohave Drive within the access control limits between Kaibab Road and Grand Canyon Road. The proposed new right-or-way, slope and drainage easements are shown in the plan sheets in **Appendix A**. The recommended alternative will require acquisition of approximately 80.86 acres of new right-of-way, 3.93 acres for slope easements, and 1.27 acres for drainage easements from private lands. This includes the 34.18 acres that will be dedicated from the landowner adjacent to the TI in accordance with the development agreement. All new right-of-way for this project will be acquired by the COK in accordance with the LOI between COK and ADOT. **Table 4-2** summarizes the parcels and new right-of-way requirements for Phase 1 improvements.

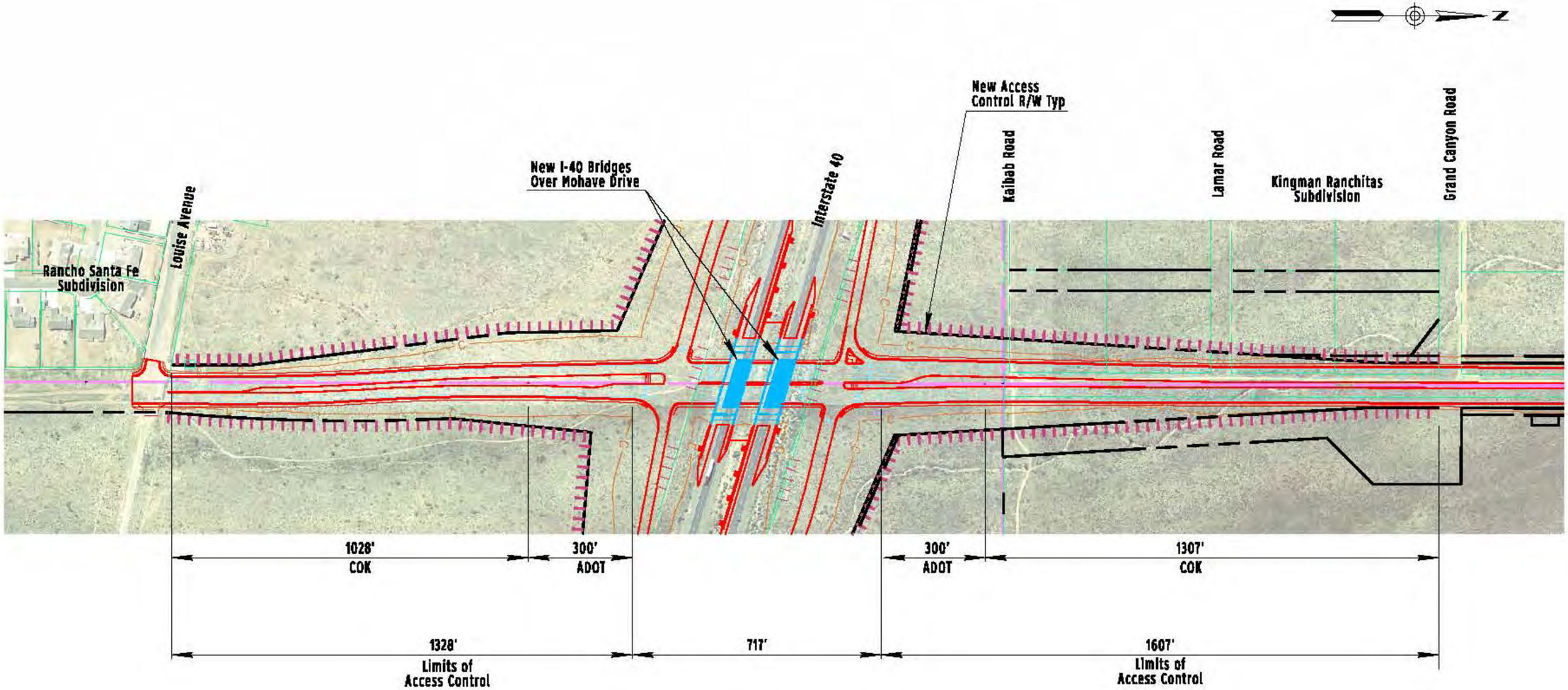

Figure 4-1 Proposed Access Control Limits

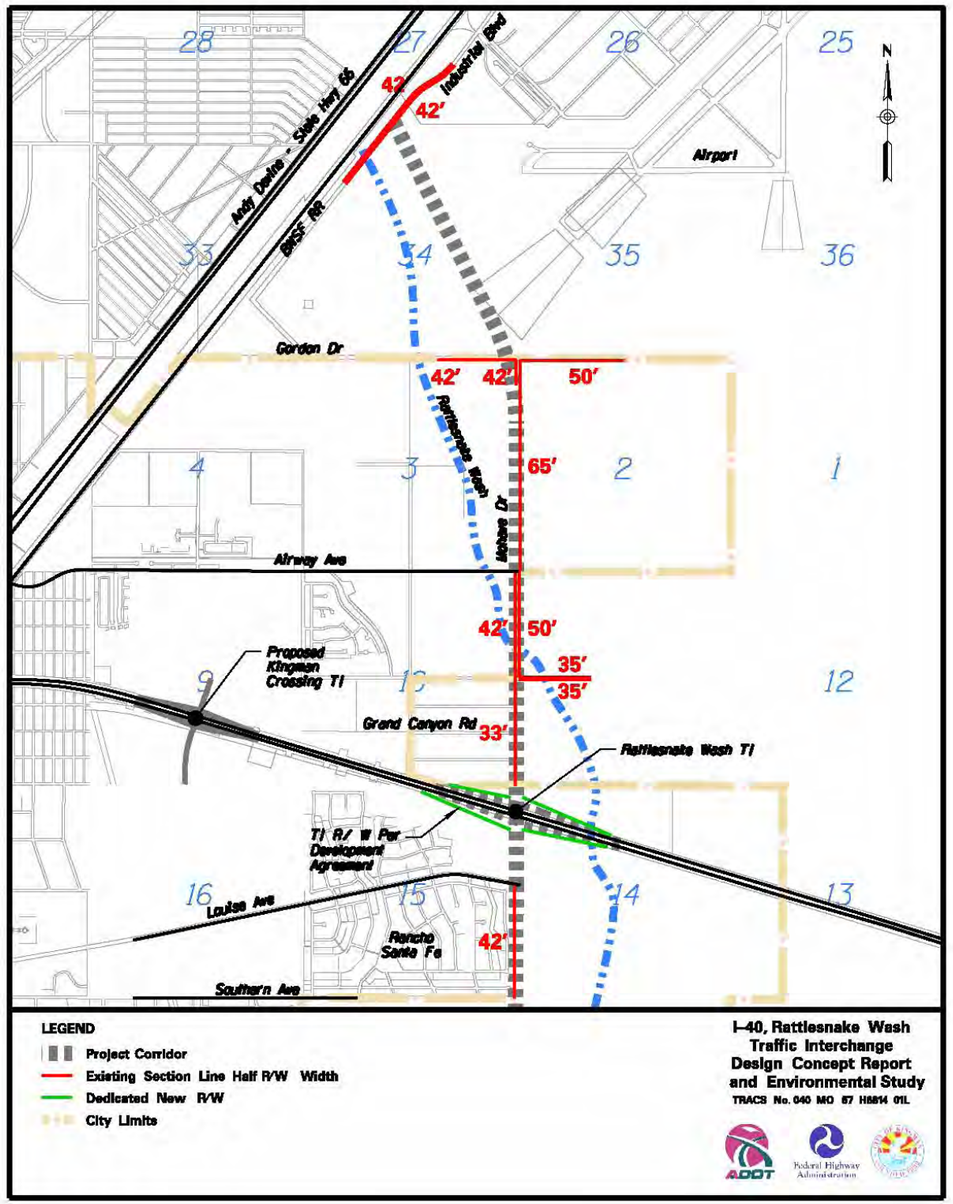

Figure 4-2 Existing Right-of-Way Map

Table 4-2 Right-of-Way Requirements for the Recommended Alternative

Parcel Number	Existing Section line Right-of-Way Width (ft)	New Right-of-Way Width (ft)	Area of New Right-of-Way (acres)	Slope Easement Width (ft)	Slope Easement Area (acres)	Drainage Easement Area (acres)
322-08-064	0	0-4	0.01	0	0	0
322-08-063	0	4-32	0.14	0	0	0
322-08-062	0	32-0	0.09	0	0	0
322-01-078	0	Varies	9.37	0	0	0
322-27-028	0	Varies	10.78	0	0	0
322-27-001	0	Varies	6.21	0	0	0
322-12-003	0	Varies	9.06	0	0	0
322-08-057	33	Varies	0.96	0	0	0
322-08-056	33	Varies	0.90	0	0	0
322-08-041	33	Varies	0.75	0-12	0.03	0
322-08-040	33	Varies	0.64	12-20	0.13	0.10
322-08-025	33	65	0.22	20	0.14	0
322-08-024	33	65	0.22	20	0.14	0.07
322-08-009	33	65	0.24	20	0.14	0
322-08-008	33	65	0.24	20	0.14	0
322-09-001	0	65	4.65	20	0.97	0.10
322-16-008	42	65	3.44	20	0.46	0.23
322-16-001	42	65	0.72	20	0.56	0.05
322-09-002	35	65	3.8	20	1.02	0.07
322-03-001	0	65	6.03	20	0.10	0
322-01-075	65	0	0.03	20	0.10	0.25
322-15-001	42	130	3.32	0	0	0.05
324-13-007	0	130	19.04	0	0	0.97
		Totals =	**80.86**		**3.93**	**1.89**

4.6 DRAINAGE

4.6.1 Drainage Area Description

The project site watershed ranges in elevation from 3,346 to 5,560 feet above sea level. The southern (upper) portion of the watershed has steep mountainous conditions with numerous non-contiguous rock outcrops. At the base of the mountains, a more gradual, north-sloping piedmont with defined high desert arroyos predominates in the northern two-thirds of the watershed. Interstate 40 bisects the watershed from east to west. To the north of I-40, the piedmont becomes increasing flatter and the streambeds become significantly less defined. The Kingman Airport is located approximately 3 miles to the north of the proposed Rattlesnake Wash (Mohave Drive) / I-40 traffic interchange. Industrial Boulevard is oriented southwest to northeast, parallel to the BNSF railroad. Louise Avenue is an existing collector street approximately 0.25-mile south of I-40. Airway Avenue is located approximately one mile north of I-40.

4.6.2 Existing Drainage Conditions

The topography surrounding the project site slopes generally from south to north and rainfall runoff collects in several defined natural streambeds. There are seven existing cross-culverts under I-40, consisting of three pipe culverts and four concrete box culverts. A five-span reinforced concrete bridge is used to cross Rattlesnake Wash, which is the largest streambed that crosses I-40 within the project limits.

There are no existing culverts along the proposed Mohave Drive alignment. However, there is an existing sand/gravel pit located approximately 0.25-mile north of the Rattlesnake Wash I-40 bridge. The pit has strongly influenced the drainage along Rattlesnake Wash south of the interstate. Severe head cutting of the streambed is evident to within approximately 600 feet downstream (north) of the existing bridge. Left unchecked over time, the head cutting will progress southward to I-40.

Rattlesnake Wash is one of four project streambeds that will cross the northern leg of Mohave Drive. New drainage structures will be required for those new crossings. Rattlesnake Wash and the streambed immediately east join at a cattle tank formed by a 10-foot high berm, about 500 feet west of the Mohave Drive alignment. Although this cattle tank is not expected to contain the 100-year storm runoff, it is expected to provide retention for storms up to the 10-year frequency.

The City of Kingman Municipal Airport has an unlined trapezoidal channel along the southern perimeter. This airport interceptor channel (AIC) intercepts Rattlesnake Wash and three of the other streambeds that cross I-40. The AIC crosses Industrial Boulevard at an existing ford crossing and then crosses under the BNSF railroad through an existing nine-span steel-beam bridge.

4.6.3 Drainage Design Criteria

The drainage design standards should comply with the COK standards for the design of Mohave Drive. In those instances where the COK has no applicable drainage standard, the ADOT drainage standards should be followed. The design of all facilities along I-40 and on ADOT right-of-way should follow the ADOT drainage standards explicitly. No conflicts with COK standards are anticipated in that case.

City of Kingman Standards

The following standards were taken from the "Design and Administrative Manual — Kingman Area Drainage Master Drainage Plan" (June 1988):

- Drainage systems — 10-year storm runoff (and minimize damage from the 100-year storm event).
- Onsite runoff storage — Not anticipated on this project.
- The flow path of the 100-year runoff shall not be changed.
- Maximum overtopping depth — 1.0 foot for the 100-year flow.
- No roadway overtopping for 10-year storm runoff (unless designated by COK).
- Onsite runoff shall be contained between curbs for 10-year storm, and insure that one non-flooded lane is possible in each direction (for streets with four lanes or more).
- Maximum depth of water shall be 0.5 feet over the crown (non-curbed sections).
- Finished floors of buildings must have at least one foot of freeboard above the 100-year water surface.
- The 100-year flow shall be contained within the street right-of-way.

The flows from some existing culverts or streambeds have been diverted for short distances and then would be discharged at a location that would not constitute a change in the 100-year flow. To ensure that there are no 100-year flow diversions, all of the new drainage structures (with two exceptions) were designed for the 100-year flows. The two exceptions are located on Industrial Boulevard where the culverts were only sized for the capacity of the existing drainage ditch.

See **Table 4-3** for COK drainage criteria and design storm frequencies:

Table 4-3 COK Design Storm Criteria Outside ADOT Access Control Limits

Drainage Feature	Description of Criteria
Conveyance:	"Drainage Systems shall be designed to convey nuisance runoff from the more frequent minor storm of 10 years and to minimize major damage from the 100 year storm event."
Storage:	"When storage is utilized, the facilities shall be sized to limit downstream flows for the 10 and 100 year storms, to the greater of historic levels, or the capacity of the downstream conveyance system."
Drainageways:	"Major drainageways shall be designated on the Kingman Area Master Drainage Plan." "Major Drainageways generally serve areas greater than 150 acres. For the Kingman Area the major drainageways have been identified in the Kingman Area Master Drainage Plan."
Cross Street Flow:	"Regardless of the size of the culvert, bridge or dipped section, the street crossing is to be designed to convey the 100-year storm runoff under and/or over the road to an area downstream of the crossing to which the flow would have gone in the absence of the street crossing." For the 100-year event the maximum flow depth is "1.0 feet of depth at crown." For 10-year flow event, "No flow across streets except at designated dip crossings."
Longitudinal Street Flow:	"Runoff from the 10 year storm shall be contained within the street section with no curb overtopping." "For 4 or more laned streets at least 1 traffic lane free of water in each direction." "Where no curb exists, the maximum depth of water shall be 0.5 feet over the crown." "Runoff from the 100 year storm shall not enter buildings and when flowing along streets, shall be contained within the street right-of-way." For the 100-year storm event, "Flow to be calculated assuming contained in right-of-way with top water elevation within 1 foot of lowest finished floors."

Source: Boyle Engineering Corporation, *Design and Administrative Manual, Kingman Area Master Drainage Plan*, June 1988.

ADOT Standards

The ADOT hydrologic modeling standards are shown in the Highway Drainage Design Manual, 2006. ADOT has established drainage design standards that appear in the Roadway Design Guidelines, Chapter 600 – Drainage (2007). The functional drainage design class for I-40 roadway is Class 1, and Mohave drive will be Class 2.

The flows through four existing culverts need to be diverted into a storm drain along Mohave Drive. To ensure that no overtopping of new interchange cut slopes would occur, the drainage laterals used to divert these flows were designed for the 100-year flow.

Refer to **Table 4-4** for ADOT drainage criteria and design storm frequencies:

Table 4-4 ADOT Design Storm Criteria within Access Control Limits

Roadway	Operational Drainage Frequency Class	Design Storm Frequency[2]	Freeboard			Culverts[5]						Roadway Drainage			
			Bridges[3]	Flood Control Channels[4]		Box Height (H)		Diameter (D)		Headwater		Ditches[6]		Curbed Roadway	
				Non-leveed	Leveed	Minimum	Desirable	Minimum	Desirable	Maximum	Project Desirable	Roadway Runoff Only	Offsite Flow Interception	Design Storm Frequency	Pavement Spread[7]
(Name)	(Drainage Class)	(yrs)	(ft)	(ft)	(ft)	(ft)	(ft)	(in)	(in)	NA	NA	(yrs)	(yrs)	(yrs)	(ft)
I-40	1	50	3	1	2	4	6	18	24	1.5H or 1.5D	H or D	10	50	10	NA
Mohave Dr @ TI	2	50	1	1	2	4	6	18	24	1.5H or 1.5D	H or D	10	50	10	13.5

Notes:
1 *ADOT's Design Philosophy:* "Generally, the minimum drainage facility would be one which perpetuates the existing drainage conditions (for the 100-year event) as nearly as possible."
2 Design storm frequencies may be controlled by other considerations, i.e., FEMA regulations.
3 Freeboard should not be less than the design freeboard of the approach channel.
4 Minimum freeboard should be the larger of the table value or $F=0.20(y+(v^2/2g))$, where y is depth of flow (ft), v is mean velocity (fps), and g is acceleration due to gravity ($32.2\ ft/sec^2$). Additional height shall be provided on the outside of bends for the additional rise in the water surface due to centrifugal force.
5 For the design flood, the headwater level should be no higher than 3 inches below the pavement.
6 Channel depth of flow shall be limited to preclude saturation of the roadway pavement structural section at a 10-year frequency storm.
7 For a multi-lane roadway, the allowable spread width is 1/2 lane + shoulder, turn lane, parking lane, and/or distress lane. Allowable ponding depth shall not exceed the top of curb.

Source: Arizona Department of Transportation, Highways Division, *Roadway Design Guidelines, Chapter 600-Highway Drainage Design*, January 2007.

4.6.4 Hydrology

The overall watershed was modeled originally in the Kingman Area Master Drainage Plan (KAMDP, July 1988; Boyle Engineering). In 1999, Stantec Consulting, Inc. prepared the report "Hydrology and Sediment Analysis — Mohave Wash Channelization." This report was an update to the earlier KAMDP, with revisions to the HEC-1 model. That Stantec HEC-1 model was used as the basis for the HEC-1 model for this Rattlesnake Wash TI DCR Drainage Study.

The 25-year, 50-year, and 100-year storm frequencies were modeled for the revised HEC-1 model and for the smaller watershed sub-basins that were modeled using the Rational method.

The more refined topography provided by COK was used to delineate the watershed to reflect the needs of this Rattlesnake Wash TI project. The major watershed basins with areas greater than 160 acres were modeled using HEC-1 and the Green-Ampt infiltration parameters from the KAMDP Update. Additional sub-basins were delineated to define the storm runoff at I-40 and the proposed Mohave Drive crossings. The Rational Method was used to model the sub-basins with areas less than 160 acres. The storm runoff flows are summarized in **Table 4-5** and the watershed delineation maps are shown in **Appendix C**.

Table 4-5 Summary of Offsite Flows

Conc Point (notes 1,2,3)	Station	Q10 (cfs)	Q50 (cfs)	Q100 (cfs)
Interstate 40				
25	2934+00	80	147	179
30	2938+36	52	97	119
35	2943+50	6	11	13
SB40	2947+00	233	397	470
45	2953+00	61	112	137
50	2960+50	33	68	86
55	2964+64	4	7	8
60	2967+49	131	271	342
50-55-60	2960+50	167	344	434
RATTLE	2978+18	1,275	2,266	2,722
(SB1130)	2979+82			
Mohave Drive				
49	182+20 Rt	21	43	54
(note 4)	182+90 Rt			
Stm Drn Start	196+58	167	344	434
Stm Drn End	219+13 Lt			
100	213+50	17	32	39
100&110	223+30	55	112	141
115	233+38	23	47	59
RATTLE (CP1155)	240+90	2,260	4,094	4,948
125	245+30	10	19	23
130	258+60	10	19	23
SB135	270+00	135	247	299
136 (Note 5)	300+61	32	65	82
137	331+41	14	28	34
138	364+42	38	79	100
CP140	376+96	2,587	4,716	5,708
Industrial Drive				
CP1120	na	1,334	2,382	2,876
145	na	4	8	10
CP1170	na	4,739	8,961	10,941

Notes:
1) Concentration points are for rational sub-basins unless prefix is SB or CP.
2) SB prefix is HEC-1 single sub-basin.
3) CP prefix is HEC-1 concentration point (summation of flows).
4) Culvert 49 takes flow on east side of Louise Ave/Mohave Dr intersection. Matching culvert takes flow on west side of the intersection.
5) Culvert 136 is a low flow culvert. Bypass flow continues north.

4.6.5 Drainage Design

Preliminary offsite and onsite drainage systems have been developed for the Phase 1 recommended alternative. The following sections describe the proposed drainage systems, and they are also shown on the preliminary plan sheets in **Appendix A**.

I-40 TI Drainage Offsite Design

Nine culvert crossings along I-40 located to the west of the new TI at Stations 2905+05, 2910+05, 2915+00, 2923+57, 2928+75, 2934+00, 2938+36, 2943+50, and 2947+00 will be extended to accommodate the roadway widening of I-40 and the new west side ramps.

The new TI will have the crossroad depressed under I-40. The entrance and exit ramps will rise from below existing ground, and then match existing I-40 grade. The four culvert crossings that will be cut off by the new ramps are:

- Station 2953+00 – Flow to be diverted into new 60-inch storm drain lateral.
- Stations 2960+50, 2964+64, and 2967+49 – Culvert inflows will be diverted into a 10-foot bottom width, 2:1 side slope, concrete lined channel. The channel will be constructed south and above the new cut slope for Ramp D. The channel will discharge into a drop inlet for a new 78-inch diameter storm drain lateral.
- The inflows from the new 60-inch and 78-inch laterals will be combined into a new 84-inch diameter storm drain that will also receive inflows from other minor laterals along Mohave Drive. The 84-inch storm drain will bend 45 degrees and discharge into an existing streambed at Station 219+13 Left on Mohave Drive.

I-40 TI Onsite Drainage Design

The onsite runoff from the ramps and cut slopes will drain into roadside V-ditches. The V-ditch flows will be intercepted by C-15.90 median dike catch basins (area inlets) that will discharge into the main Mohave Drive storm drain. A network of minor laterals will be used along Mohave Drive under the interchange to pick up the flows from the various combination and area inlets.

The existing I-40 Rattlesnake Wash bridges will be extended on the outside to accommodate the widening of I-40 for the eastside ramps. During final design, the need for a cutoff wall in Rattlesnake Wash, downstream of the widened bridges, will need to be evaluated.

Mohave Drive Drainage Design

Mohave Drive will be constructed for approximately 0.9 mile to the south of I-40. This portion will match existing grade near Louise Avenue. Roadside runoff from the cut slopes will drain northward alongside the roadway curb and gutter along Mohave Drive. Combination catch basins with slotted drain will be used to intercept the flow and then discharge it into the proposed storm drain.

Also to the south of the TI, crown ditches will be necessary to protect the cut slopes. The crown ditch above Ramp D is the aforementioned concrete channel. The crown ditch that protects Ramp C will discharge into the cross culvert Station 2947+00. No crown ditches are needed for the northwest or northeast quadrant of the interchange.

Several culvert crossings, storm drain system, and roadside channels are needed along Mohave Drive, starting just north of the new TI. Generally, each culvert should be designed for the 100-year flow. Exceptions are noted. Refer to **Table 4-6** for a summary of proposed culvert sizes and storm drain. Dumped riprap plunge basins will be used at the outlets of all new culvert crossings.

- A minor streambed near Station 213+50 will be intercepted by a new V-ditch on the east side of the road. The V-ditch flow will combine with flow from another minor streambed at Station 223+30, where a new two-barrel, 42-inch culvert will cross under Mohave Drive. Catch basins will discharge directly into the culvert barrel.
- At Station 233+38, a new two-barrel 30-inch culvert will cross Mohave Drive. Catch basins will discharge directly into the culvert barrel.
- Rattlesnake Wash crosses the north leg of Mohave Drive at approximately Station 240+90. A five-barrel, 12-foot x 9-foot concrete box culvert will be installed to convey the 100-year flow at this crossing. The culvert will be designed such that there will be no rise in the 100-year water surface. Catch basins will drain into laterals that discharge directly through the new CBC wing walls.
- Upstream of the new CBC, the Rattlesnake Wash channel should be widened to a 64-foot bottom width with 2:1 side slopes for a distance of approximately 370 feet upstream of the CBC inlet. Slope mattress gabion bank lining is recommended for the 10-foot high banks of the inlet channel. A 5-foot high, concrete drop structure (or two shorter drops) should be installed to improve the hydraulics through the box culvert. To protect the streambed from the anticipated turbulence in this area, a fully lined concrete channel with 13-foot high, 1.5:1 side slope banks is recommended in the short channel reach between the drop structure and the CBC inlet.
- The outlet of the new Rattlesnake Wash culvert will be protected from local scour with a dumped riprap plunge basin. The optimal plunge basin configuration and size should be determined during final design. The energy will be dissipated at that point to return the flow condition to the existing downstream flow conditions in the streambed.
- At Station 245+30, a new 24-inch culvert with a roadside V-ditch inlet channel will be installed.
- At Station 258+60, a new 36-inch culvert with a roadside V-ditch inlet channel will be installed. The culvert will serve as the outfall for a new 24-inch diameter storm drain along Mohave Drive.
- North of Airway Avenue, no curb and gutter will be used. Pavement runoff will sheet drain over the new fill slopes.
- At Station 270+00 to 275+00, a new 6-foot unlined channel will be needed to cut through a short low ridge.
- At Station 300+61, a new 24-inch culvert will be installed to maintain a minimal flow in the existing minor streambed. Any flows that exceed the capacity of the culvert will continue to flow northward and spread out as it does in the existing case.
- A roadside V-ditch is needed along the west side starting at 314+00 and continuing north to a new 36-inch culvert at Station 331+41 that drains from south to north.
- A 6-foot bottom width roadside channel is needed along the west side starting at 335+00 and continuing northwest to a new two-barrel 36-inch culvert at Station 364+42 that drains from south to north.
- A roadside V-ditch is needed on the west side between 364+50 to 372+50.
- From 372+50 to 376+96, a new 6-foot bottom width, unlined channel should be installed to intercept nuisance sheet flows. The channel discharges into a new two-barrel, 36-inch culvert that also carries flows from the existing roadside ditch on the east side of Industrial Boulevard. Greater ditch flows are expected to overtop Industrial Boulevard, as it does with the existing case.
- The existing Airport Interceptor Channel dip crossing of Industrial Boulevard will remain unchanged.
- New combination catch basins with slotted drain will be needed at various points along Mohave Drive. New catch basins will connect directly to new cross culverts where possible. Where required, collector storm drains will discharge into the next available downstream cross culvert.

4.7 EARTHWORK

The earthwork for Phase 1 of this project will consist of approximately 425,000 cubic yards of roadway excavation and approximately 30,000 cubic yards of channel excavation for Rattlesnake Wash improvements.

4.7.1 Material Sources

Material sources were researched via files at the ADOT Materials Section in Phoenix, Arizona and through interviews with ADOT Kingman District. Currently, no non-commercial sources were recognized in the vicinity of the project corridor. ADOT approved commercial borrow pits identified in the vicinity of the site are presented in **Table 4-7**.

Table 4-6 Summary of Drainage Improvements

WTRSHD CONC POINT	Existing WB STATION or Median Sta	Q100 (cfs)	Existing Pipe/ CBC Size	Round Pipe Alternative			Required CBC Alternative (mult bbl)		Recommended Culvert Size Action	Number of Barrels	Diam (in.)	Width (ft)	Height (ft)
				Pipe Diam (in.)	Number of Barrels	Width (ft)	Height (ft)	Number of Barrels					
Interstate 40													
25	2934+00	179	6'x5' CBC						Extend Inlet	1		6	5
30	2938+36	119	10'x10' CBC						Extend Inlet & Outlet	1		10	10
35	2943+50	13	24"						Extend Inlet	1	24		
40	2947+00	470	2-8'x5' CBC			8	5	3	Extend Inlet & Outlet	2		8	5
									New Median Inlet into CBC				
45	2953+00	137	60"	72	1	6	5	1	New Storm Drain Lateral (Note 3)	1	60		
50	2960+50	86	42"	54	1				Intercept w/ Channel (Note 5)				
55	2964+64	8	30"	30	1				Intercept w/ Channel (Note 5)				
60	2967+49	342	6'x7' CBC			6	5	2	Intercept w/ Channel (Note 5)				
50-55-60		434							New Storm Drain Lateral (Note 5)	1	78		
Rattlesnake	2978+18	2722		no chg					Widen Bridge, outside lanes				
	2979+82												
Mohave Drive													
49	182+20 Rt	54							New Culvert, East side Louise Ave intersection	1	36		
(Note 4)	182+20 Lt	54							New Culvert, West side Louise Ave intersection	1	36		
Stm Drn	196+58	434							New storm drain trunk line	1	84		
to	219+13 Lt												
100	213+50	39		36	1	8	6	1	Intercept w/ V-Ditch, East Side				
100&110	223+30	141		60	1				New Culvert	2	42		
115	233+38	59		48	1				New Culvert	2	30		
Rattlesnake	240+90	4948				12	12	4	New Box Culvert	5		12	9
125	245+30	23		36	1				New Culvert	1	24		
130	259+13	23		36	1				New Culvert	1	36		
135	270+00	299				10	6	1	Intercept w/ 6' Bottom Width Channel				
136	300+61	82							New Low Flow Culvert (Bypass stays in chl)	1	24		
137	331+41	34								1	36		
138	364+42	100								2	36		
140	376+96	5708 (Note 6)				12	12	5	New Culvert	2	36		
Industrial Drive													
1120		2876				12	10	3	no change				
145		10		24	1				no change				
1170		10941				12	12	9	no change				

Notes:

1) Q100 flows in cfs were calculated in Table B3.2 using ADOT Rational method and rainfall data.
2) All pipe or CBC sizes were selected to keep 100-yr WSEL at or below the crown of pipe.
3) Flow diverted into new lateral at Sta 2955+00 Right. Plug and abandon existing culvert. Sub-basin 49 is a part of Sub-basin 50.
4) New culverts on both sides of Louise Ave/Mohave Drive intersection. Assume equal flows on both sides (per sub-basin 49). Sub-basin 49 is a part of Sub-basin 50.
5) Individual flows of SB 50, 55, 60 is diverted into concrete lined channel (crown ditch above Ramp D). Combined flow from 50-55-60 flows into new lateral at Sta 2963+00 Right. Plug and abandon existing culverts 50, 55, and 60.
6) New culvert along Industrial Drive will only be sized for the capacity of the existing ditch.

Table 4-7 Borrow Pits

Commercial Pit Number	Name of the Pit	Operator	Highway and Milepost	Approximate Distance from the Site
PS2012	Cofer Material Pit	Mr. Clinton Cofer	US 93 @ MP 96	21 miles
CM0021	Hualapai Pit	Desert Construction, Inc.	SR-66 @ MP 55	4 miles
CM0022	McConnico Pit	Desert Construction, Inc.	I-40 @ MP 45	12 miles
CM0292	McCall Material Sources	McCall Construction	I-40 @ MP 51	6 miles
CM0428	Kingman Pit	TRI-R Construction, Inc.	I-40 @ MP 59	3 miles
CM0438	Mineral Park Decorative Rock – Cedar Hill	Red Mountain Mining, Inc.	I-40 @ MP 66	10 miles
CM0440	J.D.I. Enterprises, LLC.	J.D.I. Enterprises, LLC	I-40 @ MP 59	3 miles
CM 2044	Kingman Pit	Sunshine Concrete and Materials, Inc.	I-40 @ MP 46	10 miles

According to the ADOT Kingman District, the nearest borrow pit to the site is operated by Freiday Construction. This borrow pit is not an ADOT approved commercial borrow pit. Information on the environmental clearance can be obtained from ADOT Environmental Group.

We have also researched the materials source information available from past projects in the vicinity of the project corridor. However, the majority of the sources are no longer available. Currently, ADOT has no plans to license other new pits.

The preliminary recommendations presented in this report are based on our review of pertinent data, our field observations, and our experience on similar projects. These preliminary recommendations are not suitable for final design and are subject to change as additional information is obtained. In general, the design and construction means and methods should be in accordance with ADOT standards as outlined in the Preliminary Engineering and Design Manual (PEDM), unless specifically noted.

4.7.2 General Suitability of Site Soils

We anticipate that the engineering characteristics of on-site soils would not preclude the construction and performance of the proposed roadway and the associated traffic interchange. Our background review and visual observations indicate that the on-site soils contain varied proportions of caliche clays, sands, silts, and gravels. The properties of these materials may also vary along the extent of the project corridor. The on-site soil should be suitable for both common and structural fill. All areas to receive fill, and areas of structures and pavements, should be stripped of vegetation, organic matter, debris, rubble, and other unsuitable materials. Stripped soils should not be used as engineered fill, but may be used in landscape areas.

The presence of clayey soils that exhibit R-values of less than 20 may define the utilization of comprehensive earthwork operations and may need reinforcement using geogrids or similar geosynthetics. Further, clayey soils may provide poor subgrade support, may be expansive under some moisture and loading conditions, and may be corrosive to ferrous metals. Corrosive characteristics of the onsite soils may impact the integrity of steel and concrete structures that are in contact with the onsite soils. Therefore, we recommend that a geotechnical evaluation consisting of subsurface exploration, laboratory testing, and engineering analyses be performed in general accordance with ADOT's PEDM guidelines for this proposed alignment.

4.7.3 Excavation, Rippability, and Trenching

Based on the results of the preliminary site reconnaissance, it is possible that rock outcrop may be encountered and some cobbles and boulders could also be possibly encountered during excavation. These materials could be more difficult to excavate depending on the actual size of the materials encountered during excavation and could slow the rate of excavation and/or necessitate the use of more aggressive techniques. A detailed study consisting of test pits and/or seismic refraction surveys should be performed to assess the excavatability of onsite materials.

4.7.4 Cut Slopes and Embankments

Based on our visual observations, for planning purposes, Unprotected permanent cut and fill slopes should be designed no steeper than 3H:1V (Horizontal: Vertical). This assumes that the groundwater level is below the toe of the slope naturally. It is possible that rock outcrop may be encountered during excavation. Slopes cut into rock, if any, should range between 1:1 (H:V) and 1.5:1 (H:V) depending on the degree of fracturing.

Unprotected slopes may rill and erode if exposed to running water. Silty sands and soils containing fine sand are more susceptible in this regard. Adequate drainage control and temporary erosion control covering could minimize erosion and promote post-construction vegetation. Plating the slopes with gravelly material will reduce precipitation impact and slow the rate of erosion. Along longer slopes, brow ditches should be considered to reduce the amount of surface flow on the slope face.

4.7.5 Earthwork Factors

Significant earthwork is expected for the final configuration of the project. Earthwork factors are estimated based on the observed densities of the in-place materials and an assumed compacted dry density. Based on this estimation a shrinkage factor of up to 20 percent may be used over the project length for estimating earthwork volumes; however, some soils may exhibit more or less shrinkage. For rock material, a swell factor of 10 percent may be estimated for planning purposes. A ground compaction of 0.2 to 0.3 feet can be estimated for planning purposes.

4.7.6 Foundation Design

Foundation systems that are typically considered for bridges include shallow spread footings and deep foundations such as drilled shaft foundations. In current practice in Arizona, pile foundations are no longer in common use due to the development of high-torque auger drilling equipment that is used to rapidly construct cost effective drilled shaft foundations.

Drilled shaft foundations can be constructed with minimal disturbance to existing developed areas and are suitable for construction through fill and/or native soils. Drilled shaft foundations may be considered to support bridge piers at the traffic interchange proposed for this project. A combination of drilled shaft foundations and shallow spread footing foundations may be considered to support bridge abutments at the

traffic interchange. Shallow spread footings are typically considered to be more cost effective than drilled shafts, especially in depressed roadway segments and where near surface medium dense to dense soil is present, which allows for relatively shallow excavation depths. However, depressed roadway sections are also susceptible to flooding and the foundation soils may become waterlogged for an extended period of time. Accordingly, use of spread footings in depressed roadway sections will require careful evaluation of foundation soils to determine if they are sensitive to moisture induced settlement or volume change.

The onsite soils along the proposed corridor and at the traffic interchange are generally suitable for supporting shallow and deep foundations and for any retaining walls that are required. Overexcavation, recompaction, and subgrade preparation will be required to avoid potential problems to the shallow foundations. The bearing pressures should be further evaluated based on the equivalent uniform bearing pressure distribution.

4.7.7 Pipe Culverts and Concrete Box Culverts

Soil tests shall be performed in accordance with the RDG, Appendix A, *Pipe Selection Guidelines and Procedures* for pipe culverts and concrete box culverts.

The soil tests should include soil pH and soil sulfate values within 15 feet of all new and extended concrete culvert (pipe or box) locations. If soil pH is less than 5, acceptable concrete admixtures should be added to the concrete to satisfy the low pH condition. Type V cement may need to be specified for concrete pipe and box culverts if high sulfate conditions exist.

At new pipe locations, soil tests should include values for soil conditions within 15 feet of the pipe for soil pH, soil resistivity, high soil moisture locations and high soil sulfate level locations. Refer to *Pipe Selection Guidelines and Procedures* for further information.

4.8 CONSTRUCTABILITY AND TRAFFIC CONTROL

It will be necessary to maintain two lanes of traffic in each direction on I-40 during construction of the grade separation structures to minimize disruption and delays to the traveling public. Given that the new eastbound (EB) and westbound (WB) I-40 overpasses will be constructed at grade on the existing alignments, temporary detours will be required during construction. One alternative is to construct one bridge at a time leaving I-40 open for traffic in one direction and providing a detour in the median for the opposing traffic. With a median width of 69'-0" this alternative can easily provide two lanes of traffic with sufficient shoulder widths. Another alternative will be to first construct all four ramps for use as temporary detours before constructing the EB and WB overpass structures.

Using the new ramps as the detours would be safer than the median crossover alternative because there would be no undivided two-way traffic condition. Also, using the ramps instead of constructing median crossovers would likely be more cost effective because it would result in less throw-away pavement, shorter time traffic is detoured, and both bridges can be built simultaneously. The entrance ramps would be designed as two-lane ramps to the gore areas with temporary striping to tie into I-40 traffic lanes. The exit ramps would be designed as single-lane ramps with wider shoulders to accommodate two lanes of detour traffic. Temporary pavement will be needed through the ramp intersections with Mohave Drive to provide a smooth transition across the intersection. Preliminary Detour Plan and Profile Sheets are contained in **Appendix E**.

Using the ramps as detours will require a temporary drainage system to drain the depressed ramp detours during construction. The south ramp detour will cut off drainage flows from four culverts. Prior to constructing the ramp detours and the I-40 overpass structures, the new 84-inch storm drain pipe will need to be jacked and bored under I-40 and constructed to Rattlesnake Wash so that the depressed ramp detours can be drained to prevent the depressed section from flooding. If the geotechnical analysis determines that jacking an 84-inch pipe under I-40 is not feasible, an alternative method to keep the depressed pump detours from flooding will need to be developed, or using median crossover detours will need to be used.

4.9 INTERSECTIONS

4.9.1 Mohave Drive and Louise Avenue

Initially the Mohave Drive and Louise Avenue intersection will operate as a two-way intersection with Louise Avenue extending to the west and Mohave Drive extending to the north. Eventually Mohave Drive will be extended to the south for a future third leg. Future development to the east may extend Louise Avenue to the east creating a fourth leg. Initially the intersection does not need to be signalized, but this will need to be evaluated once Mohave Drive is extended to the south to Hualapai Mountain Road and if Louise Avenue is extended to the east. Conduit should be installed at the intersection for future traffic signal connections. Southbound Mohave Drive will need to be striped to taper from two southbound lanes to a right-turn only lane for the interim condition.

4.9.2 Mohave Drive and I-40 Ramps

Both ramp TI intersections will be signalized. For the south side ramp TI intersection, the eastbound off-ramp approach would contain a combination through lane with dual left turns and a single right-turn lane. A minimum of 325 feet of left-turn storage would be provided. The southbound Mohave Drive approach would contain dual left turns and two through lanes. A minimum of 225 feet of left-turn storage would be provided. The northbound Mohave Drive approach would contain a left-turn lane extension and three through lanes.

For the north side ramp TI intersection, the westbound off-ramp approach would contain a combination through lane with dual right turns and single left-turn lane. A minimum of 325 feet of right-turn storage would be provided. The southbound Mohave Drive approach would contain dual left-turn lane extensions, two through lanes, and a right-turn lane. A minimum of 225 feet of left-turn storage would be provided. The northbound Mohave Drive approach would contain a left-turn lane and three through lanes. A minimum of 150 feet of left-turn storage would be provided.

4.9.3 Mohave Drive and Airway Avenue

The Mohave Drive and Airway Avenue intersection will be constructed as a four-way intersection and will not be signalized until Airway Avenue is improved from its current state as a graded dirt road.

The northbound Mohave Drive approach would contain dual left turns and two through lanes and a right-turn only lane. The northbound departure would contain two through lanes, which would then taper down to one lane for the interim condition and would be configured so that it can be easily widened to the ultimate three through lanes. A minimum of 250 feet of left-turn storage (125 feet each lane) would be provided.

The southbound Mohave Drive approach would contain a left-turn lane and two through lanes. A minimum of 150 feet of left-turn storage would be provided. The southbound will be configured so that it can be easily widened to the ultimate three through lanes plus right- and left-turn lanes.

The eastbound approach would be configured to match the future widening of Airway Avenue, which will be a four-lane section with a flush dual left-turn lane. The westbound approach would be configured to match future widening of Airway Avenue to the east, which will be a four-lane section with a flush continuous left-turn lane.

4.9.4 Mohave Drive and Industrial Boulevard

The Mohave Drive and Airway Avenue intersection will be constructed as a three-way intersection and will not be signalized. The northbound Mohave Drive approach would contain a combination through left and left-turn lane for the interim condition.

4.10 UTILITIES

Table 4-8 Existing Utilities

Utility Owner	Utility Type	Location	Conflicts
Black Mesa Pipeline	18" coal slurry pipeline (inactive)	Along the Gordon Drive section line	Roadway in fill, no anticipated conflicts
Citizens Communication	Fiber Optic Line	Along Airway Avenue and Louise Avenue	Roadway in fill, no anticipated conflicts
	TI Carrier Line	Within a 10-foot easement along the north I-40 right-of-way line	New depressed ramps and Mohave Drive will require relocating the TI carrier line to outside and along the new north I-40 right-of-way line within a new utility easement
City of Kingman	12" water line	Extends west from a well site at the west side of the airport.	Roadway in fill, no anticipated conflicts
El Paso Natural Gas	24", 30" & 34" natural gas pipelines	Within the utility corridor south of I-40	Phase 2 Mohave Drive improvements to cross over pipeline, no anticipated conflicts
Mohave Electric Cooperative	69 kV transmission line	Within the utility corridor south of I-40	Phase 2 Mohave Drive improvements to cross under power lines, no anticipated conflicts.
Questar Pipeline	16" natural gas pipeline "Four Corners Line"	Within the utility corridor south of I-40	Phase 2 Mohave Drive improvements to cross over pipeline, no anticipated conflicts
Transwestern Pipeline	30" natural gas pipeline	Within the utility corridor south of I-40	Phase 2 Mohave Drive improvements to cross over pipeline, no anticipated conflicts
Unisource Energy (Gas)	6" natural gas pipeline	Diagonally crosses airport property through Section 34 within a 60-foot utility easement and continues in a southeast direction toward I-40	Runs parallel and adjacent to Mohave Drive improvements, no anticipated conflicts
W.A.P.A.	2-230 kV transmission lines	Within the utility corridor south of I-40	Phase 2 Mohave Drive improvements to cross under power lines, no anticipated conflicts.

Unisource Energy (electric) plans to build a new substation south of the airport in the SW ¼ of Section 1. A new 69 kV distribution line would extend south from the new substation to the mid-section line of Section 12 and turn to the west and extend to the east side of Section 9. This new line would cross the proposed alignment of Mohave Drive. Another 69 kV line would tee into the first line near the midpoint of Section 11 and travel south across I-40 to the large utility corridor. The line would then parallel the corridor to the southwest and extend to an existing substation near Hualapai Mountain Road.

The Black Mesa coal slurry pipeline is currently inactive. There are plans to relocate the line. The relocation would begin near DW Ranch Road and I-40. The new line would travel west along I-40 and then turn southwest and run along the large utility corridor. The new line is planned to be activated in 2009.

4.11 STRUCTURES

4.11.1 I-40 Overpass Structure

Two new overpass structures should be constructed along I-40 to span over Mohave Drive, which will be depressed under I-40. The proposed structures will carry two through lanes in each direction. The proposed structures should be constructed to an outside width of 62'-10" to provide for a future third through lane and a wider shoulder when I-40 is widened in the future.

The primary factors that govern the selection of structure type for Rattlesnake Wash TI Overpass are as follows:

Maximum Span Length – The roadway geometry at Mohave Drive dictates a span length of approximately 186 feet. Feasible structure types for a single-span structure are (1) cast-in-place post-tensioned box girders, and (2) steel plate girders. A two-span structure is also feasible but was not considered due to the following reasons:

1) Risk of impacting the pier in median
2) Sight distance and visibility would be impaired by the piers
3) Limits flexibility of changing lane configurations for future widening of Mohave Drive if needed in the future.

Constructability – The overpass alternative will be constructed at-grade. Since the surrounding area is relatively undeveloped, the range of feasible construction techniques for this bridge will not be limited by the ability to obtain access to the area beneath and surrounding the new structures.

Recommended Structure Type

The required span length is too great for precast-prestressed I-girders and the relatively high cost of steel plate girders is not justified. Therefore, a cast-in-place post-tensioned box girder is recommended. A top-down construction method is recommended as described below.

Construction Sequence:

1) Excavate to the depth required for placement of a "waste slab"
2) Construct the abutment foundations (drilled shafts/spread footings)
3) Construct the abutment cap beams/stem walls
4) Construct a waste slab to form the soffit of the superstructure
5) Form, cast, and post-tension the superstructure
6) Excavate beneath the bridge to the level of the Mohave Drive subgrade

Superstructures

The EB and WB overpasses will consist of two single-span cast-in-place and post-tensioned concrete box girder superstructures with a total span length of 186 feet. The out-to-out width of each structure will be 60'-10" consisting of three lanes of traffic, a 12'-0" inside shoulder and a 12'-0" outside shoulder. The superstructures will have a depth of 7'-8". The overpass structure is shown on the General Plan and Elevation plan sheet in **Appendix D**.

Substructures

The substructures will consist of medium height abutments supported by either drilled shafts or spread footings depending on the geotechnical recommendations. ADOT standard cantilever retaining walls aligned parallel to I-40 will serve as wingwalls to retain the approach fills.

4.11.2 I-40 Rattlesnake Wash Bridges

The existing EB and WB Rattlesnake Wash Bridges are 5-Span Continuous Reinforced Concrete Slab structures supported on abutments with pile foundations and pier walls on spread footings. Each bridge is 163'-9 ¼" long and 40'-7" wide with a clear width of 38'-0". Both structures are in very good condition and have a sufficiency rating of 97.34. The bridges structural capacity is rated for 46 tons or approximately 28 percent greater than the minimum requirement for HS20 loading. Both the abutments and piers are protected from scour with rail bank riprap protection at the abutments and a concrete scour slab at the piers.

The EB and WB Bridges will be widened to the outside to accommodate the ramp approach for the WB off-ramp and the ramp departure for the EB on-ramp. In the westward direction near the exit gore, the widening of the WB Bridge will vary approximately 27-37 feet and the EB bridge widening will vary approximately 16-18 feet. Though the existing bridge railings (Type H-2-1) meet current standards based on the latest ADOT Bridge Inspection Report dated December 15, 2004, the inside bridge railing will also be replaced to match the new 32" F-Shape barrier on the widened section of the bridge. The rail bank protection and the concrete scour slab will also be extended as needed to accommodate the widening of each bridge. The structures are shown on the General Plan and Elevation Plan Sheets in **Appendix D**.

4.12 PAVEMENT DESIGN

The preliminary design presented has been confirmed with ADOT Materials Group and should be utilized for planning purposes only. This design is not suitable for final design. The final design should be performed with the data collected through a geotechnical study consisting of subsurface exploration, laboratory testing programs, and engineering analyses performed in general accordance with ADOT's PEDM guidelines.

The traffic loads as presented in **Table 4-9** were used in the design of preliminary pavement sections for this project. A growth rate of 4 percent was used for this project. The pavement sections as presented herein have been designed assuming an R-value of 20 and Resilient Modulus (Mr) of 8,800 for soils in accordance with ADOT's PEDM guidelines for planning purposes.

Table 4-9 Design Traffic Loads

Roadway Section	Maximum Average Daily Traffic Volume*	Lane Distribution Factor	Design Year	Estimated Rigid One-Way 18-kip ESALs	Estimated Flexible One-Way 18-kip ESALs
Mohave Drive – I-40 to Louise Ave	19,600 (Two-way)	0.9	2030	15,466,500	14,704,400
Mohave Drive – Airway Ave to I-40	48,800 (Two-way)	0.8	2030	34,229,900	32,543,400
Mohave Drive – Industrial Blvd to Airway Ave	38,200 (Two-way)	1.0	2030	–	13,433,500
I-40- TI Ramps	16,200 (One-way)	1.0	2030	23,674,100	22,507,600

* Maximum ADT Volumes for Year 2030.

For planning purposes, the preliminary pavement sections for rigid pavements as presented in **Table 4-10** were used for this project.

Table 4-10 Preliminary Rigid Pavement Structural Sections

Roadway Section	Plain Jointed PCCP (inches)	Jointed Reinforced (Dowels) PCCP (inches)	Aggregate Base (AB) (inches)
Mohave Drive – Louise Ave to I-40	–	7	4
Mohave Drive – I-40 to Airway Ave	–	8.5	4
I-40 TI Ramps	10.5	–	4

AC (base mix) is recommended in lieu of AB in depressed and/or at grade locations for the rigid pavements constructed for this project.

For planning purposes, the preliminary pavement sections for flexible pavements as presented in **Table 4-11**, were used for this project.

Table 4-11 Preliminary Flexible Pavement Structural Sections

Roadway Element	Asphaltic Concrete (AB) (inches)	Aggregate Base (AB) (inches)
Mohave Drive – Louise Avenue to I-40	9	10
Mohave Drive – I-40 to Airway Avenue	10	11
Mohave Drive – Airway Avenue to Industrial Boulevard	8	12
I-40 TI Ramps	10	14

It is recommended that the pavement be covered with ½-inch of AR-ACFC. Either hot-mix or rubberized asphaltic concrete (AR-AC) should be used for the surface course. The AR-AC should extend to the edge of pavement. The AR-AC tends to be more flexible and can retard reflection cracking better than hot-mix asphalt. The AR-AC also has a tendency to provide a smooth ride and reduce traffic-related noise. In lieu of AR-AC, an AR-ACFC may be used for final surfacing over an AC overlay over new AC pavement, and should not be placed over PCC pavement.

4.13 KINGMAN AIRPORT

The new right-of-way for Mohave Drive across the Kingman Airport property will need to be approved by the Federal Aviation Administration (FAA). The FAA administers the World War II Surplus Property Act in this case as the Kingman Airport and Industrial Park had been developed as a military airfield in the 1940s. The property south of the existing improvements (runways, taxiways, and airfield improvements) was never fully released for development, meaning that the FAA still has the final approval of all improvements. The Kingman Airport Authority is pursuing a conditional release (new administrative guidelines) of the land to develop additional industrial sites within the area; however, that process requires a full Environmental Impact Analysis and could take two or more years.

The FAA has completed an airspace study from an airspace utilization standpoint in order to release the airport property for the new Mohave Drive right-of-way from aeronautical use to non-aeronautical use. A copy of the FAA determination letter is included in **Appendix G**. The letter contains six conditions that must be met in order for the FAA to release the airport property for the new Mohave Drive right-of-way. Condition a. requires that the maximum height for the concrete curbed median not extend more than 17 feet above ground elevation. The preliminary profile for Mohave Drive meets this condition. Conditions b. and c. are directed to the construction contractor and the conditions should be included in the construction specifications developed during final design. Conditions d. and e. need to be completed by the Kingman Airport Authority and should be coordinated with during final design to assure the conditions are met. Condition f. requires that a Notice of Proposed Construction or Alteration (FAA Form 7460-1) must be submitted to FAA to determine that the road right-of-way does not impact the navigable airspace by aircraft on property located off the airport.

4.14 DESIGN EXCEPTIONS

No roadway features will require AASHTO or ADOT design exceptions.

5.0 ENVIRONMENTAL OVERVIEW

5.1 INTRODUCTION

Coordination with federal, state, local agencies, and the public was conducted to obtain information about the environmental resources in the general project area. Specific information was also obtained to define the existing social, economic, and environmental characteristics of the project area and assist the study team in identifying particular constraints to be considered in the development and preliminary analysis of alternatives. Future analyses will address environmental considerations in detail, and specific mitigation measures will be identified as part of those analyses and documentation.

Based on a review of the project area, there are no prime and unique farmlands, sole source aquifers, wetlands, designated critical habitat, wilderness areas, or wild and scenic rivers present in the project area. FHWA and ADOT have determined that a CE document is the appropriate level of NEPA documentation needed for this project. The following sections of this Environmental Overview (EO) summarize current information and identify the level of concern or sensitivity for each environmental issue.

5.2 BIOLOGICAL RESOURCES

5.2.1 Biological Community

The project area lies at approximately 3,800 feet elevation[3] on northwesterly sloping terrain within the Hualapai Valley. The Hualapai Mountains are approximately 5 miles south, the Cerbat Mountains 10 miles northwest, and the Peacock Mountains 15 miles northeast of the project area. The majority of adjacent land in the project area is under the jurisdiction of the COK. Portions of the project area occur on Kingman Airport Authority, Mohave County, and Arizona State Trust lands.

Rattlesnake Wash is an ephemeral wash draining the north end of the Hualapai Mountains to the south. The wash flows across the Hualapai Valley and into Red Lake, an ephemeral, closed-basin lake approximately 45 miles north. Other smaller ephemeral washes are present on the south end of the project area, originating in Sawmill Canyon at the north end of the Hualapai Mountains. No surface water or wetlands occur in the project area.

Native vegetation of the project area has been disturbed by livestock grazing, with little evidence of the former perennial bunch grass-dominated community. As a result of grazing, shrubs, cacti, and forbs now dominate the area. Brown (1994) classified the biotic community of the area as semi-desert grassland. Brown (1994) identified the most commonly observed elements of this community, including tobosa grass (*Pleuraphis mutica*), bush muhly (*Muhlenbergia porteri*), and several species of grama (*Buteloua* spp.) and three-awn (*Aristida* spp.) grasses.

Species composition of the project area was dominated by grazing tolerant species such as fluff grass (*Dasyochloa pulchella*), flattop buckwheat (*Eriogonum fasciculatum*), desert marigold (*Baileya multiradiata*), desert senna (*Senna armata*), purple three-awn (*Aristida purpurea*), milkvetch (*Astragalus* sp.), catclaw acacia (*Acacia greggii*), paperflower (*Psilostrophe cooperi*), creosote bush (*Larrea tridentata*), pincushion cactus (*Mammilaria grahamii*), cane cholla (*Cylindropuntia spinosior*), prickly pear (*Opuntia* sp.), globe mallow (*Sphaeralcea ambigua*), Sahara mustard (*Brassica tournefortii*), longleaf Mormon tea (*Ephedra trifurca*), yucca (*Yucca* spp.), jimson weed (*Datura stramonium*), threadleaf groundsel (*Senecio flaccidus*), burroweed (*Isocoma tenuisecta*), and crucifixion thorn (*Castela emoryi*).

5.2.2 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) list of threatened, endangered, proposed, and candidate species for Mohave County was reviewed by a qualified biologist (USFWS 2006). **Table 5-1** summarizes this list and identifies habitat requirements and potential effects on each species. No federally protected species were observed during a general site survey on May 25, 2006. In addition, no designated or proposed critical habitat occurs in the project area.

Table 5-1 USFWS Listed Species in Mohave County and Evaluation of Effects

Common Name	Scientific Name	Status	Suitable Habitat Present	Occupied Habitat Present	Critical Habitat Present	Species Affected	Critical/ Suitable Habitat Affected
Arizona cliffrose	*Purshia subintegra*	E	No	No	No	No	No
Bald eagle	*Haliaeetus leucocephalus*	T	No	No	No	No	No
Bonytail chub	*Gila elegans*	E	No	No	No	No	No
California brown pelican	*Pelecanus occidentalis californicus*	E	No	No	No	No	No
California condor	*Gymnogyps californianus*	E	No	No	No	No	No
Desert tortoise, Mohave population	*Gopherus agassizii* (*Xerobates*)	T	No	No	No	No	No
Fickeisen plains cactus	*Pediocactus peeblesianus* var. *fickeiseniae*	C	No	No	No	No	No
Holmgren (Paradox) milk vetch	*Astrgalus holmgreniorum*	E	No	No	No	No	No
Hualapai Mexican vole	*Microtus mexicanus hualpaiensis*	E	No	No	No	No	No
Humpback chub	*Gila cypha*	E	No	No	No	No	No
Jones cycladenia	*Cycladenia humilis* var. *jonesii*	T	No	No	No	No	No
Mexican spotted owl	*Strix occidentalis lucida*	T	No	No	No	No	No
Razorback sucker	*Xyrauchen texanus*	E	No	No	No	No	No
Relict leopard frog	*Rana onca*	C	No	No	No	No	No

[3] Elevations in this document are referenced to mean sea level.

Common Name	Scientific Name	Status	Suitable Habitat Present	Occupied Habitat Present	Critical Habitat Present	Species Affected	Critical/ Suitable Habitat Affected
Siler pincushion cactus	*Pediocactus sileri*	T	No	No	No	No	No
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	No	No	No	No	No
Virgin River chub	*Gila seminuda*	E	No	No	No	No	No
Woundfin	*Plagopterus argentissimus*	E	No	No	No	No	No
Yellow-billed cuckoo	*Coccyzus americanus*	C	No	No	No	No	No
Yuma clapper rail	*Rallus longirostris yumanensis*	E	No	No	No	No	No

C = Candidate, E = Endangered, T = Threatened (USFWS 2006)

5.2.3 Bureau of Land Management and Wildlife of Special Concern in Arizona

The Arizona Game and Fish Department (AGFD) was contacted for a list of special status species that occur in and near the project area. **Table 5-2** provides a list of the BLM sensitive species and Wildlife of Special Concern in Arizona (WSCA) that have the potential to occur in the project area.

Table 5-2 BLM Sensitive Species and WSCA with Potential to Occur in the Project Area

Taxon	Scientific Name	Common Name	BLM	WSCA
Mammals	*Myotis ciliolabrum*	Western small-footed myotis	X	
	Myotis occultus	Arizona myotis	X	
	Myotis volans	Long-legged myotis	X	
	Nyctinomops femorosaccus	Pocketed free-tailed bat	X	
Birds	*Athene cunicularia hypugea*	Western burrowing owl	X	
Reptiles	*Gopherus agassizii*	Sonoran desert tortoise		X
	Heloderma suspectum cinctum	Banded Gila monster	X	

5.2.4 Protected Native Plants

The Arizona Department of Agriculture (ADA) list of protected native plants (ADA 2005) was reviewed by a qualified biologist. The following species of Arizona protected native plants were observed in the project area: pincushion cactus (*Mammilaria grahamii*), cane cholla (*Cylindropuntia spinosior*), prickly pear (*Opuntia* sp.), and yucca (*Yucca* spp.).

5.2.5 Invasive Species

An evaluation for the presence of invasive species was not conducted for this EO but will be addressed in the environmental document prepared for this study.

5.3 CULTURAL RESOURCES/SECTION 4(F) PROPERTIES

An intensive pedestrian survey of the project area identified several isolated occurrences (e.g., individual lithic artifacts and historic cans) and six cultural properties. The latter include:

- A portion of the historic World War II (WWII)–era Kingman airfield
- A segment of historic Old US 93
- A segment of an unnamed, possibly historic-age road
- A possibly historic-age corral
- A possibly historic-age can scatter
- A possibly historic-age trash dump

The Kingman Airfield has previously been determined eligible for listing on the National Register of Historic Places (NRHP) under Criteria A (association with broad patterns of our history, in this case WWII), C (important architectural, engineering, or technological attributes), and D (information potential). Because Old US 93 is an element of the Historic State Highway System (HSHS), it is considered eligible for NRHP listing under Criterion D by FHWA, ADOT, and the Arizona State Historic Preservation Office. The eligibility of the additional four properties has not been assessed by earlier studies.

ADOT recommended that:

- The portion of the Kingman airfield in the project area is a non-contributing element with regard to the significance of the property as a whole.
- The segment of Old US 93 is a contributing element, but the development of an intersection would be a minor alteration to the larger road and, therefore, should be regarded as having “no adverse effect” on the structure as a whole or to the HSHS.
- The four additional properties, even assuming they are historic in age, lack sufficient information potential to be regarded as eligible under Criterion D and appear not to qualify under Criteria A, B (association with an important person), or C.
- Therefore the project may proceed with a finding of “no adverse effect.”

5.4 FLOODPLAINS

A review of the Federal Emergency Management Agency Flood Insurance Rate Maps for the project vicinity indicated that no portion of the project area is located within a 100-year floodplain. Therefore, no impacts to floodplains are anticipated.

5.5 WATER QUALITY

Waters in the U.S. are not present in the project area because there are no tributary connections to the Colorado River. Therefore, neither Clean Water Act Section 404 permitting nor Section 401 certification are required for project construction. However, due to the potential for greater than one acre of ground

disturbance, an Arizona Pollutant Discharge Elimination System permits per Section 402(p) of the Clean Water Act would likely be required during final design from the Arizona Department of Environmental Quality and a Stormwater Pollution Prevention Plan will be prepared for the project.

5.6 AIR QUALITY

The project is in an area that complies with all other national ambient air quality standards. The applicability of the federal conformity procedures to this project will be addressed during the detailed environmental impact analysis of viable alternatives.

This project is not anticipated to have an adverse effect on the air quality of the area. Some deterioration of air quality would be expected due to the operation of construction equipment and the slower traffic speeds through construction zones. However, this localized condition would be discontinued when the project is completed. Fugitive dust generated from construction activities would be controlled in accordance with the *Arizona Department of Transportation Standard Specifications for Road and Bridge Construction*, Section 104.08 (2000 Edition), special provisions, and local rules or ordinances.

5.7 NOISE IMPACTS

Because this project would involve the construction of new alignment (Mohave Drive), the project will need to be evaluated in accordance with FHWA requirements contained in 23 Code of Federal Regulations 772, *Procedures for Abatement of Highway Traffic and Construction Noise* and the ADOT *Noise Abatement Policy*, December 5, 2005. The only potential sensitive receptor area within the study limits is a residential community south of I-40 and west of Mohave Drive known as Rancho Santa Fe. Therefore, a noise analysis would need to be conducted to determine the nature and extent of noise impacts in this area. The findings of this analysis will be incorporated into the project's environmental document.

5.8 HAZARDOUS MATERIALS

A Preliminary Initial Site Assessment (PISA) was conducted for the project area. The PISA consisted of a review of the construction project work scope, on-site reconnaissance of the project area, a review of historical aerial photos, an evaluation of the regulatory database search report prepared by research firm All Lands. The purpose of the PISA was to evaluate and identify the presence of hazardous materials or similar environmental concerns.

The project area was inspected by automobile and on foot. North of I-40, the Mohave Drive alignment is mostly rural to undeveloped natural desert land. Approximately the northernmost mile of the project segment parallels a buried active natural gas line corridor. The site reconnaissance revealed only minor scattered refuse, dumped trash piles, and wind-blown trash. One newly drilled municipal water well casing was noted approximately 200 feet east of the intersection of Mohave Drive and Gordon Drive. The Rancho Santa Fe residential subdivision is located adjacent to the west side of the Mohave Drive alignment and ¼ mile south of I-40. Only negligible scattered refuse, construction waste, and wind-blown trash were noted within or adjacent to the right-of-way. Behind the Rancho Santa Fe subdivision, hundreds of cubic yards of bulldozed soils appeared to be pushed up against the outer Rancho Santa Fe subdivision wall within the ADOT right-of-way; however, the soil stockpiles did not appear to be from an outside source. No other areas of hazardous materials or similar environmental concerns were identified during site reconnaissance.

The northernmost 1-mile to 1.5-mile segment of the Mohave Road alignment and the adjacent outer perimeter area of the Kingman Airport were formerly known as the Kingman Army Airfield in the 1940s. This airfield was used as an airplane storage facility where thousands of WWII era fighter and bomber aircraft and other aircraft were parked in rows. Many of these aircraft were dismantled and the scrap aluminum recycled. A smelter was constructed to melt down metals, and other waste materials were buried in large trenches. The smelter and the trenching were located in the present-day airplane parking area, approximately 1 mile east of the proposed Mohave Drive alignment south of Industrial Drive. The existence and location of other trenching is unclear and poorly recorded. It is possible that the northernmost 1-mile section of the project area could contain areas of WWII era disposal trench pits containing nonrecyclable airplane refuse and other buried wastes.

A review of Federal and State databases in accordance with American Standard for Testing Materials standards for Phase I Environmental Site Assessments E 1527-00 was conducted for the subject property and vicinity. The review was completed by All Lands and evaluated by EcoPlan Associates, Inc. No areas of hazardous materials or similar environmental concerns were reported for the project area.

This overview did not include any inspection or analysis of concrete materials for asbestos, lead paint, or related hazardous materials. These analyses will need to be conducted as part of the environmental document.

5.9 SOCIOECONOMIC CONSIDERATIONS

The study area has been evaluated with regard to Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act, and Executive Order 12898 on Environmental Justice. Residential or commercial development adjacent to the I-40 corridor is limited to the City of Kingman, located south and east of the proposed new TI. Immediately north and northeast of the proposed new TI is unincorporated county land.

As indicated in **Table 5-3**, the project vicinity has a similar percentage of non-white residents as the City of Kingman and Mohave County. Relative to persons over the age of 65, the project vicinity as a whole has a smaller population than the City of Kingman and Mohave County but a larger population compared with the state as a whole. Fewer persons are below poverty level in the project vicinity, but the percentage of the limited mobility or disability status is significantly higher.

Although minorities are present in the study area, no distinct minority or low-income groups are in the proposed project vicinity. The proposed project would not have a disproportionately high and adverse human health or environmental effect on minority and low-income populations in this area. In general, the proposed project would benefit all residents of the area as well as travelers through the area in the form of improved roadway capacity and overall traffic operations.

Table 5-3 2000 Census Demographic Characteristics

Demographic Characteristics	Project Vicinity	City of Kingman	Mohave County	Arizona
Total population	6,067	19,755	155,032	5,130,632
Gender:				
Male	52.1%	50.0%	49.5%	49.9%
Female	47.9%	50.0%	50.5%	50.1%
Race:				
White alone	90.3%	91.1%	90.0%	75.5%
Black or African American alone	1.4%	0.8%	0.5%	3.1%
American Indian and Alaska Native alone	2.5%	1.8%	2.4%	5.0%
Asian alone	0.1%	0.4%	0.6%	1.8%
Native Hawaiian/Other Pacific Islander alone	0.0%	0.1%	0.1%	0.1%
Some other race alone	3.7%	2.6%	3.8%	0.1%
Two or more races	2.0%	3.2%	2.7%	2.8%
Age 65 and older	15.0%	17.4%	20.4%	12.8%
Below poverty level	9.8%	11.2%	13.7%	13.6%
With disability	34.8%	20.7%	22.5%	17.6%

5.10 VISUAL RESOURCES

Foreground and midground views within the project limits consist of mostly overgrazed grassland on northwesterly sloping terrain within the Hualapai Valley. Interstate 40 bisects the center of the project area. The remainder of the project limits north and south of I-40 is undeveloped. Vegetation is sparse, with scattered shrubs, forbs, and grasses throughout the project area. Background views include undeveloped grassland, the Kingman Airport, and the outskirts of Kingman. In the distance are the Hualapai Mountains to the south, the Cerbat Mountains to the northwest, and the Peacock Mountains to the northeast.

Because this project would construct approximately 6 miles of new roadway, the existing visual character of the project area would be altered. There is existing unpaved roadway along portions of the Mohave Drive alignment, but the new roadway would be paved and include a median, sidewalks, and curb and gutter. However, changes in the viewshed would be limited to the foreground and midground views; background views from the Mohave Drive alignment would be unchanged.

5.11 LAND USE

The northern end of the project area is part of the Kingman Airport. There is a gravel mine in Rattlesnake Wash near I-40. The Rancho Santa Fe housing subdivision is located south of I-40 and west of the Mohave Drive alignment. Other land uses in the project area include livestock grazing and dispersed recreation. The BLM lands near the southern end of the project area are used for short-term camping, off-highway vehicle use, hiking, and target shooting.

5.12 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

Table 5-4 is a list of public and agency meetings conducted or planned for this project.

Table 5-4 Public and Agency Meetings

Type	Date	Time	Location	Number of Attendees (excluding consultants)
Kick-off Meeting	April 3, 2006	10:00 AM	City of Kingman City Council	19
Agency Scoping	May 16, 2006	2:00 PM	Kingman Police Department Training Room	16
Public Scoping	May 16, 2006	5:30 PM	Kingman Police Department Training Room	26
Public Meeting	August 22, 2006	5:30 PM	Kingman Police Department Training Room	48
Public Meeting	June 26, 2007	5:30 PM	Mohave County Board of Supervisors Room	46

Literature Cited

ADA. 2006. Protected Native Plants. http://www.azda.gov/ESD/protplantlst.htm#. Accessed October 4, 2006. Arizona Department of Agriculture, Phoenix, Arizona.

Brown, D.E. 1994. Desert Plants, Biotic Communities of the American Southwest–United States and Northwestern Mexico. University of Arizona Press, Tucson, Arizona.

USFWS. 2006. Arizona Ecological Services Field Office Web site, http://arizonaes.fws.gov/. Arizona federally listed species, by county. Accessed August 11, 2006.

6.0 ITEMIZED COST ESTIMATE

Preliminary cost estimates were prepared for Phase 1 and Phase 2 improvements and are summarized in **Table 6-1**. The Detailed Itemized Cost Estimates are shown on the following pages. Costs are based upon unit prices obtained from recent ADOT bid tabulations and assume construction will commence in FY 2013 (measured in 2007 dollars).

Table 6-1 Summary of Project Costs

Phase	Total Construction Costs	Design Costs	Right-of-way Costs	Utility Relocation Costs	Pavement Incentive Costs	Total Project Costs
1	$35,831,000	$2,518,000	$1,167,000	$250,000	$138,000	$39,904,000
2	$10,471,000	$733,000	$545,000	–	–	$11,749,000

As per the LOI, ADOT and COK have agreed to share the construction costs for Phase 1 improvements at a 70 percent (ADOT) / 30 percent (COK) ratio, excluding right-of-way costs. ADOT has committed funding for design, and the COK is responsible for right-of-way acquisition for Phase 1. The COK is solely responsible for design, construction, and right-of-way costs for Phase 2 improvements. **Table 6-2** summarizes the shared costs.

Table 6-2 Summary of Shared Project Costs

Phase	ADOT Project Costs			COK Project Costs		
	Construction Costs*	Design Costs	Right-of-way Costs	Construction Costs	Design Costs	Right-of-way Costs
1	$25,082,000	$2,518,000	$0	$10,749,000	$0	$1,167,000
2	$0	$0	$0	$10,471,000	$733,000	$545,000
Totals	$25,082,000	$2,518,000	$0	$21,220,000	$733,000	$1,712,000

*Includes Pavement Incentive and Utility Relocation costs.

Project Number: 40 MO 56 H681401C /
Location: RATTLESNAKE WASH TI

PHASE I

Segment 0

Alternative 0

DCR

		UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
2010011	CLEARING AND GRUBBING	ACRE	48.00	1,000.00	48,000
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	12,456	4.00	49,824
2020048	REMOVAL OF STRUCTURE (HEADWALLS)	EACH	4	1,000.00	4,000
2020071	REMOVE GUARD RAIL	L.FT.	1,960	4.00	7,840
2020101	REMOVE FENCE	L.FT.	9,600	1.00	9,600
2030301	ROADWAY EXCAVATION	CU.YD.	427,010	5.00	2,135,050
2030451	CHANNEL EXCAVATION	CU.YD.	30,000	6.00	180,000
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	56,593	40.00	2,263,720
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (10")	SQ.YD.	18,320	50.00	916,000
4040111	BITUMINOUS TACK COAT	TON	56	400.00	22,400
4040116	APPLY BITUMINOUS TACK COAT	HOUR	103	150.00	15,450
4040230	ASPHALT BINDER (PG 70-10	TON	4,349	450.00	1,957,050
4060006	ASPHALTIC CONCRETE (3/4" MIX)	TON	83,645	40.00	3,345,800
4060026	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	836	90.00	75,240
4140040	ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT-RUBBER)	TON	4,783	40.00	191,320
4140042	ASPHALT RUBBER MATERIAL (FOR AR-ACFC)	TON	430	550.00	236,500
4140044	MINERAL ADMIXTURE (FOR AR-ACFC)	TON	50	90.00	4,500
5010107	PIPE, CORRUGATED METAL, SLOTTED, 18"	L.FT.	440	100.00	44,000
5012524	STORM DRAIN PIPE, 24"	L.FT.	3,255	80.00	260,400
5012530	STORM DRAIN PIPE, 30"	L.FT.	956	100.00	95,600
5012560	STORM DRAIN PIPE, 60"	L.FT.	631	275.00	173,525
5012578	STORM DRAIN PIPE, 78"	L.FT.	300	350.00	105,000
5012584	STORM DRAIN PIPE, 84"	L.FT.	2,130	400.00	852,000
5012924	PIPE CULVERT, 24"	L.FT.	340	80.00	27,200
5012930	PIPE CULVERT, 30"	L.FT.	412	100.00	41,200
5012936	PIPE CULVERT, 36"	L.FT.	1,092	120.00	131,040
5012942	PIPE CULVERT, 42"	L.FT.	368	140.00	51,520
5012954	PIPE CULVERT, 54"	L.FT.	40	240.00	9,600
5012960	PIPE CULVERT, 60"	L.FT.	20	275.00	5,500
5014524	FLARED END SECTION, 24" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	5	600.00	3,000
5014530	FLARED END SECTION, 30" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	4	700.00	2,800
5014536	FLARED END SECTION, 36" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	12	800.00	9,600
5030001	CONCRETE CATCH BASIN (C-15.10) SINGLE, H=8' OR LESS	EACH	26	3,500.00	91,000
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	8	4,000.00	32,000
5030152	CONCRETE CATCH BASIN (MEDIAN DIKES)	EACH	3	4,500.00	13,500
5030702	JUNCTION STRUCTURE (8'X8' VAULT)	EACH	2	8,000.00	16,000
5030703	JUNCTION STRUCTURE (10'X10' VAULT)	EACH	1	10,000.00	10,000
5050001	MANHOLE (C-18.10) (NO. 1) (FOR PIPES 6" TO 36")	EACH	11	3,000.00	33,000
5050002	MANHOLE (C-18.10) (NO. 1) (FOR PIPES OVER 36")	EACH	2	5,000.00	10,000
6010008	STRUCTURAL CONCRETE (CLASS S)	CU.YD.	1,942	500.00	971,000

Project Number: 40 MO 56 H681401C /
Location: RATTLESNAKE WASH TI

Segment 0

Alternative 0

		UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
6010020	STRUCTURAL CONCRETE (CLASS B)	CU.YD.	94	500.00	47,000
6050002	REINFORCING STEEL	LB.	248,830	1.10	273,713
606X005	CANTILEVER SIGN STRUCTURE	EACH	2	15,000.00	30,000
606X008	FOUNDATION FOR CANTILEVER SIGN STRUCTURE	EACH	2	8,000.00	16,000
606X011	MISC SIGNING	L.SUM	1	7,000.00	7,000
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC)(0.060")	L.FT.	104,991	0.50	52,496
7040073	PAVEMENT LEGEND (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	24	150.00	3,600
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	25	150.00	3,750
706X001	PAVEMENT MARKER, RAISED	EACH	373	10.00	3,730
708X003	PERMANENT PAVEMENT MARKINGS	L.FT.	66,600	0.50	33,300
733X001	TRAFFIC SIGNAL	EACH	2	150,000.00	300,000
736X007	ROADWAY LIGHTING	L.SUM	1	100,000.00	100,000
807X001	LANDSCAPING ESTABLISHMENT	L.SUM	1	50,000.00	50,000
9020028	CHAIN LINK FENCE	L.FT.	9,650	15.00	144,750
9050001	GUARD RAIL, W-BEAM, SINGLE FACE	L.FT.	2,600	20.00	52,000
9050026	GUARD RAIL TERMINAL (TANGENT TYPE)	EACH	9	2,500.00	22,500
9050040	GUARD RAIL, END TERMINAL ASSEMBLY	EACH	9	2,000.00	18,000
9050404	GUARD RAIL TRANSITION,W-BEAM TO CONCRETE HALF BARRIER	EACH	8	2,000.00	16,000
9080031	CONCRETE CURB (C-05.10) (TYPE G)	L.FT.	38,007	18.00	684,126
9080084	CONCRETE CURB AND GUTTER (TYPE D)	L.FT.	16,155	25.00	403,875
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	125,494	5.00	627,470
9080288	CONCRETE WHEEL CHAIR RAMP	EACH	14	800.00	11,200
9130004	RIPRAP (SLOPE MATTRESS)	CU.YD.	1,590	80.00	127,200
9130007	RIPRAP (DUMPED)	CU.YD.	900	40.00	36,000
9190001	CONCRETE GORE PAVING	SQ.YD.	742	40.00	29,680
9201006	CONCRETE CHANNEL LINING (6")	SQ.YD.	2,751	30.00	82,530
999X003	BRIDGE WIDENING (I-40 EB RATTLESNAKE WASH BRIDGE	SQ. FT.	3,742	110.00	411,620
999X003	BRIDGE WIDENING (I-40 WB RATTLESNAKE WASH BRIDGE)	SQ. FT.	5,960	110.00	655,600
999X004	NEW BRIDGE (I-40 OVERPASS)	SQ. FT.	23,374	110.00	2,571,140
				DCR SUBTOTAL	21,265,059
934XX01	MISCELLANEOUS WORK	COST	15%		3,189,759
				SUBTOTAL	24,454,817
207XX01	DUST PALLIATIVE	COST	1%		244,548
209XX01	FURNISH WATER	COST	1%		244,548
701XX01	MAINTENANCE AND PROTECTION OF TRAFFIC	COST	4%		978,193
810XX01	EROSION CONTROL AND POLLUTION PREVENTION	COST	1%		244,548
924XX02	CONTRACTOR QUALITY CONTROL	COST	2%		489,096

ARIZONA DEPARTMENT OF TRANSPORTATION

Estimated Engineering Construction Cost

Project Number: 40 MO 56 H681401C /
Location: RATTLESNAKE WASH TI

		UNIT	QUANTITY	UNIT PRICE ($)	AMOUNT ($)
Segment 0					
Alternative 0					
925XX01	CONSTRUCTION SURVEYING AND LAYOUT	COST	2%		489,096
				SUBTOTAL	27,144,847
901XX01	MOBILIZATION	COST	10%		2,714,485
				SUBTOTAL	29,859,332
100XX01	CONTINGENCY	COST	5%		1,492,967
100XX03	CONSTRUCTION ENGINEERING	COST	15%		4,478,900
				SUBTOTAL	35,831,198
PROJECT WIDE					
401X002	PCCP SMOOTHNESS INCENTIVE	SQ.YD.	18,320	1.00	18,320
417X002	AC (END PRODUCT) (SHRP) MATERIAL QUALITY INCENTIVE	TON	79,515	1.50	119,273
				SUBTOTAL	137,593
OTHER COST					
	FINAL DESIGN COSTS	COST	7%		2,517,815
	RIGHT-OF-WAY (TO BE ACQUIRED BY THE CITY OF KINGMAN)	ACRE	46.68	25,000.00	1,167,000
	UTILITY RELOCATION (T1 CARRIER LINE)	LSUM	1	250,000.00	250,000
				SUBTOTAL	3,934,815

Summary For Segment 0 Alternative 0	
DCR	35,831,198
PROJECT WIDE	137,592
OTHER COST	3,934,815
TOTAL PROJECT COST	39,903,606

SUMMARY		
Segment 0	Alternative 0	39,904,000

ARIZONA DEPARTMENT OF TRANSPORTATION

ITEMIZED ESTIMATE

I-40 Rattlesnake Wash Mohave Drive Alternative S4 - Phase 2
Design Concept Report and Environmental Studies
TRACS No. 040 MO 57 H6814 01L

Item No	Item Description	Unit	Quantity	Unit Price	Amount
2010011	CLEARING AND GRUBBING	ACRE	40	$1,000.00	$40,000.00
2020101	REMOVE FENCE	L.FT.	2,000	$1.00	$2,000.00
2030301	ROADWAY EXCAVATION	CU.YD.	250,000	$5.00	$1,250,000.00
2030451	CHANNEL EXCAVATION	CU.YD.	10,000	$6.00	$60,000.00
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	25,664	$40.00	$1,026,564.00
4040116	APPLY BITUMINOUS TACK COAT	HOUR	47	$150.00	$7,045.50
4040270	ASPHALT BINDER (PG 70-10)	TON	1,787	$450.00	$803,952.77
4060006	ASPHALTIC CONCRETE (3/4" MIX)	TON	34,359	$40.00	$1,374,357.60
4060026	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	344	$90.00	$30,923.05
4140040	ASPHALTIC CONCRETE FRICTION COURSE (ASPHALT-RUBBER)	TON	2,272	$40.00	$90,860.00
4140042	ASPHALT RUBBER MATERIAL (FOR AR-ACFC)	TON	204	$550.00	$112,439.25
4140044	MINERAL ADMIXTURE (FOR AR-ACFC)	TON	23	$90.00	$2,044.35
5012924	PIPE CULVERT, 24"	L.FT.	600	$80.00	$48,000.00
5012936	PIPE CULVERT, 36"	L.FT.	400	$275.00	$110,000.00
5012948	PIPE CULVERT, 48"	L.FT.	500	$200.00	$100,000.00
5012960	PIPE CULVERT, 60"	L.FT.	300	$400.00	$120,000.00
6010003	STRUCTURAL CONCRETE (CLASS S) (FC = 3,500)	CU.YD.	229	$500.00	$114,700.00
6050002	REINFORCING STEEL	LB.	32,040	$1.10	$35,244.00
6016088	HEADWALL (48 - 60" PIPES)	EACH	12	$5,000.00	$60,000.00
608XX01	SIGNING(	COST	1	$2,000.00	$2,000.00
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC)(0.060")	L.FT.	39,375	$0.50	$19,687.50
7060001	PAVEMENT MARKER, RAISED (REFLECTIVE)	EACH	7,875	$10.00	$78,750.00
736X007	ROADWAY LIGHTING	LSUM	1	$250,000.00	$250,000.00
807X001	LANDSCAPING ESTABLISHMENT (LANDSCAPE AND IRRIGATION)	LSUM	1	$50,000.00	$50,000.00
9080031	CONCRETE CURB (C-05.10) (TYPE G)	L.FT.	31,500	$12.00	$378,000.00
	DCR SUBTOTAL				$6,166,565.01
934XX01	MISCELLANEOUS WORK (20%)	COST	20%		$1,233,313.00
	SUBTOTAL				$7,399,881.61
207XX01	DUST PALLIATIVE (	COST	1%		$73,998.82
209XX01	FURNISH WATER (	COST	1%		$73,998.82
810XX01	EROSION CONTROL AND POLLUTION PREVENTION (	COST	1%		$73,998.82
701XX01	MAINTENANCE AND PROTECTION OF TRAFFIC	COST	0.2%		$14,799.76
924XX02	CONTRACTOR QUALITY CONTROL	COST	2%		$147,997.63

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ARIZONA DEPARTMENT OF TRANSPORTATION

ITEMIZED ESTIMATE

I-40 Rattlesnake Wash Mohave Drive Alternative S4 - Phase 2
Design Concept Report and Environmental Studies
TRACS No. 040 MO 57 H6814 01L

Item No	Item Description	Unit	Quantity	Unit Price	Amount
925XX01	CONSTRUCTION SURVEYING AND LAYOUT (	COST	2%		$147,997.63
	SUBTOTAL				**$7,932,673.09**
901XX01	MOBILIZATION	COST	10%		$793,267.31
	SUBTOTAL				**$8,725,940.40**
	CONTINGENCIES	COST	5%		$436,297.02
	CONSTRUCTION ENGINEERING	COST	15%		$1,308,891.06
	TOTAL CONSTRUCTION COST				**$10,471,128.48**
	FINAL DESIGN COSTS	COST	7%		$732,978.99
	RIGHT-OF-WAY	ACRE	21.8	$25,000.00	$545,000.00
			TOTAL PROJECT COST =		**$11,749,107.47**

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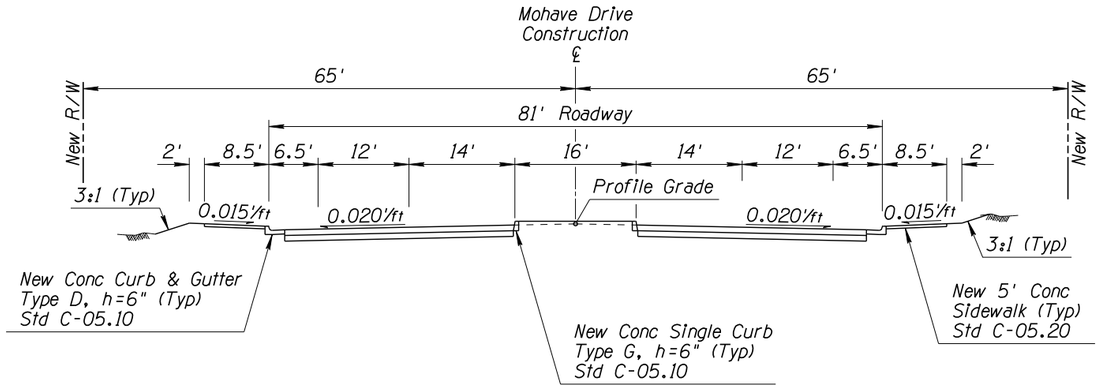
Print Date: 7/26/2007
Page 2

APPENDIX A

TYPICAL SECTIONS AND PLAN AND PROFILE SHEETS FOR PHASE 1 RECOMMENDED ALTERNATIVE

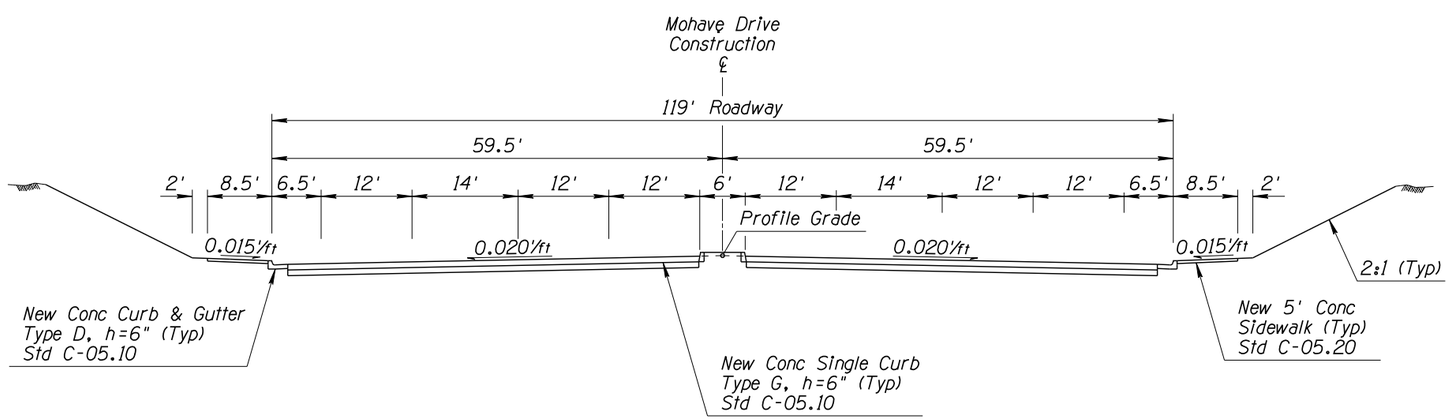
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		1	40	

040 M0 055



TYPICAL SECTION: 4-LANE w/ CURBED MEDIAN

Louise Drive to I-40



TYPICAL SECTION: 8-LANE w/ CURBED MEDIAN

At I-40 within Interchange

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DRIVE
TYPICAL SECTIONS

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
1 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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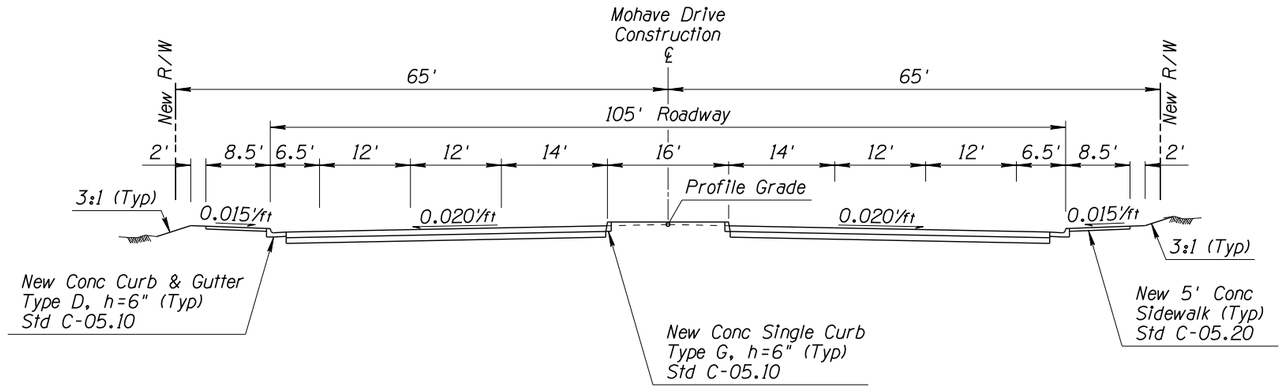
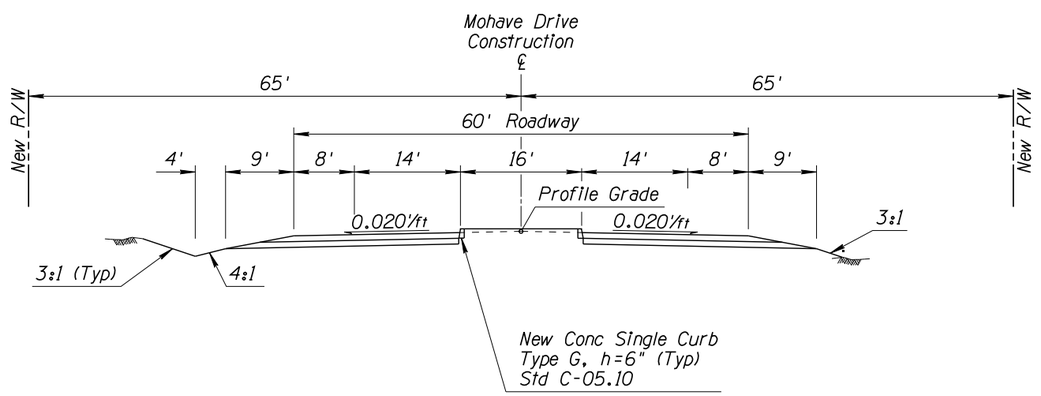
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		2	40	

040 M0 055



TYPICAL SECTION: 6-LANE w/ CURBED MEDIAN

I-40 to Airway Avenue



TYPICAL SECTION: 2-LANE w/ CURBED MEDIAN

Airway Avenue to Industrial Drive

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I - MOHAVE DRIVE
TYPICAL SECTIONS

PRELIMINARY
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ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN
DWG NO: 2 OF 40
TRACS NO. H6814 01L

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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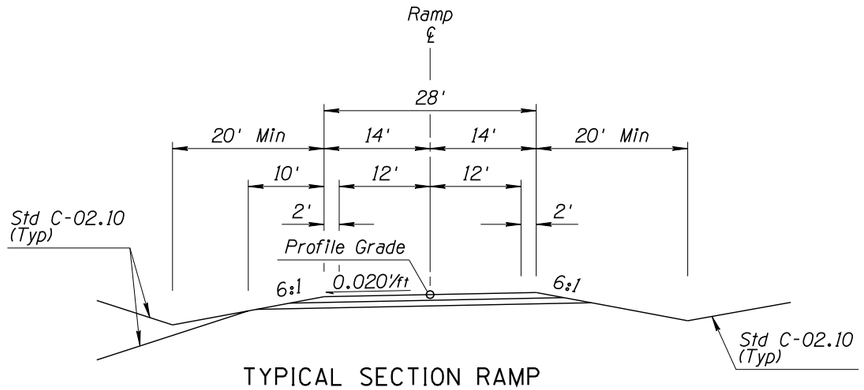
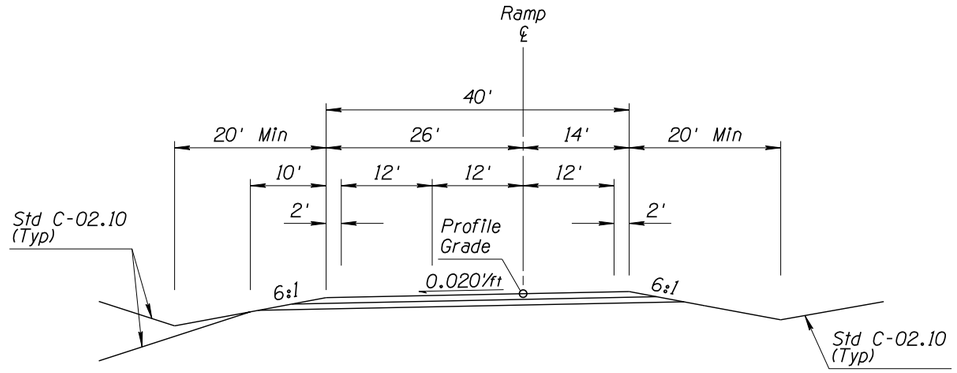
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		3	40	

040 M0 055



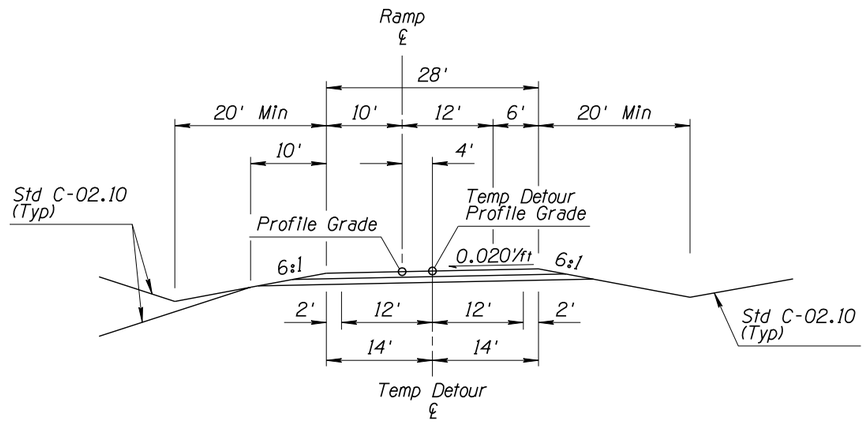
TYPICAL SECTION RAMP

On Ramp



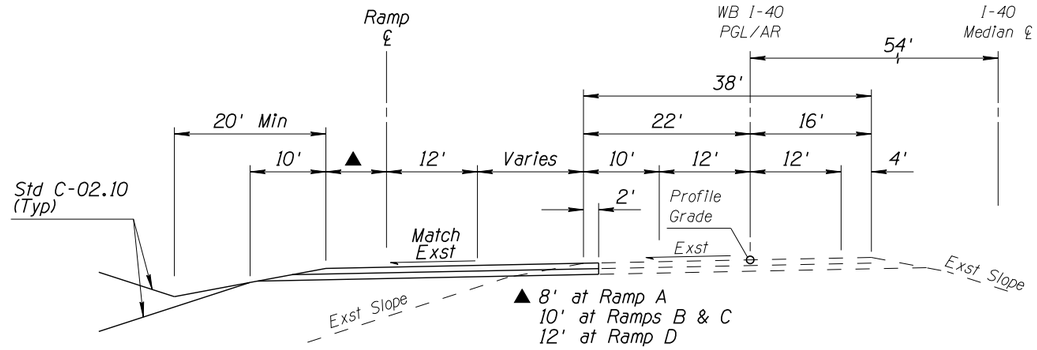
TYPICAL SECTION RAMP

Off Ramp at Cross Road



TYPICAL SECTION RAMP

Off Ramp



TYPICAL SECTION WB I-40

Ramp Accel/Decel Lane
EB Ramp D Similar

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - RAMP & I-40
TYPICAL SECTIONS

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
3 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		4	40	

040 MO 055

322-07-013

Exst I-40 Cst ℄
Sta 2912+00, 76.0' Lt
Begin Pvmt Taper

Exst VMS
Sign Structure
Protect in Place

Proposed Kingman
Crossing TI Ramp C
By Others

10' Exst
Utility Easement

Exst Communication
Utility Line (T1 Carrier)
To Remain

Exst R/W &
Access Control

Exst I-40 Cst ℄
Sta 2918+00, 88.0' Lt
End Pvmt Taper

2905 2910 2915 2920

Sta 2905+05±
Exst 54" Culvert

Exst I-40 Cst ℄

50:1 Taper

154' Exst R/W
22' 12' 10'
108' 54' 16' 12' 4'
54' 16' 12' 4'
154' Exst R/W
22' 12' 10'

14' 74' Sawcut 88'
74' Sawcut 88'
14'

25:1 Taper

Sta 2910+05±
Exst 24" Culvert

Sta 2915+00±
Exst 6'x 3'x 195'CBC
Extend Lt

Exst R/W &
Access Control

Proposed Kingman
Crossing TI Ramp D
By Others

322-07-015

Exst I-40 Cst ℄
Sta 2916+00, 76.0' Rt
Begin Pvmt Taper

Exst I-40 Cst ℄
Sta 2919+00, 88.0' Rt
End Pvmt Taper

322-07-015

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - I-40 PLAN
STA 2900+00 to 2920+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	
TRACS NO. H6814 01L		4 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		4A	40	

040 M0 055

322-07-013

322-08-064

322-07-015

322-27-25

Exst Communication Utility Line (TI Carrier) To Remain

Exst R/W & Access Control

10' Exst Utility Easement

Exst I-40 Cst ℄

Sta 2928+75± Exst 60" Culvert Extend Rt

Sta 2934+00± Exst 6'x 5'x 200' CBC Extend Lt & Rt

Sta 2923+57± Exst 12'x 10'x 196' CBC Extend Lt & Rt

Exst R/W & Access Control

Section Line

2920 2925 2930 2935

154' Exst R/W 22' 12' 10' 14' 74' Sawcut 88'

108' 54' 16' 12' 4' 74' Sawcut 88'

54' 16' 12' 4' 14'

154' Exst R/W 22' 12' 10'

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - I-40 PLAN
STA 2920+00 to 2935+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

DWG NO

TRACS NO. H6814 01L

4A OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		5	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

14 CURVE DATA

PI Sta 15+62.85

Main Curve
Δ=5°37'25"Lt
D=0°30'00"
R=11459.16'
L=1124.80'
T=562.85'
Ext=13.81'
Super=nc

Mohave Dr Ramp A Cst ℄ Sta 15+96.47=
93.52'Lt I-40 Cst ℄ Sta 2943+84.61
Nose Control Point

Bgn Mohave Dr Ramp A Cst ℄ Sta 10+00.00=
78.0'Lt I-40 Cst ℄ Sta 2937+88.41

Mohave Dr Ramp A Cst ℄
Sta 12+14.18, 8.0'Lt
Shoulder Angle Point

Exst Communication
Utility Line (T1 Carrier)
To Be Relocated

Section Line

New R/W &
Access Control

New 10'
Utility Easement

322-08-061

322-08-062

322-08-063

322-27-001

Sta 2947+00±
Exst 2-8'x 5' CBC
Extend Lt & Rt
Install New Median CB

Exst R/W &
Access Control

Mohave Dr Ramp A Cst ℄

10' Exst
Utility Easement

PT 21+24.80

Exst I-40 Cst ℄

74' Sawcut
88'

Sta 2938+00±
Exst 10'x 10' CBC
Extend Lt & Rt

Sta 2943+50±
Exst 24" Culvert
Extend Rt

154' Exst R/W

25:1 Taper

Exst R/W &
Access Control

Mohave Dr Ramp B Cst ℄

Bgn Mohave Dr Ramp B Cst ℄ Sta 10+00.00=
78.0'Rt I-40 Cst ℄ Sta 2936+23.49

New R/W &
Access Control

322-27-25

Mohave Dr Ramp B Cst ℄ Sta 17+50.08=
102.54'Rt I-40 Cst ℄ Sta 2943+73.03
Nose Control Point

21 CURVE DATA

PI Sta 17+61.68

Main Curve
Δ=7°36'18"Rt
D=0°30'00"
R=11459.16'
L=1521.13'
T=761.68'
Ext=25.28'
Super=nc

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - I-40 PLAN
STA 2935+00 to 2950+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
5 OF 40

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		6	40	
		040 M0 055			

(31) CURVE DATA
PI Sta 14+54.39
Main Curve
Δ=9°07'22"Rt
D=3°00'00"
R=1909.86'
L=304.99'
T=152.37'
Ext=6.07'
Super=0.034'/ft

N

Mohave Dr Cst ℄ & Section Line

End Mohave Dr Ramp A Cst ℄ Sta 31+33.91= Mohave Dr Cst ℄ Sta 202+42.00

New R/W & Access Control

New 10' Utility Easement

322-27-001

322-12-003

New 10' Utility Easement

New R/W & Access Control

Bgn Mohave Dr Ramp C Cst ℄ Sta 10+00.00= Mohave Dr Cst ℄ Sta 202+30.00

Mohave Dr Ramp C Cst ℄

PC 13+02.02

25:1 Taper

Mohave Dr Ramp A Cst ℄

Exst R/W & Access Control

Exst Communication Utility Line (TI Carrier) To Be Relocated

10' Exst Utility Easement

Sta 2953+00± Exst 60' Culvert Plug & Abandon

Exst I-40 Cst ℄ Sta 2958+75± to 2960+61± New WB 186' Span Bridge

Exst I-40 Cst ℄ Sta 2959+84.37= Mohave Dr Cst ℄ Sta 200+00.00

Sta 2960+50± Exst 42" Culvert & CB Remove

Exst R/W

New Guard Rail

New 84" Storm Drain

New Guard Rail

New Cable Barrier (Typ)

Exst I-40 Cst ℄

Exst I-40 Cst ℄ Sta 2959+07± to 2960+93± New EB 186' Span Bridge

Sta 2964+64± Exst 30" Culvert Plug & Abandon

Mohave Dr Ramp D Cst ℄

Varies 25:1 Taper

Mohave Dr Ramp B Cst ℄

PT 25+21.13

PC 27+82.95

New 60" Storm Drain

PT 30+86.24

Exst R/W & Access Control

322-01-078

Bgn Mohave Dr Ramp D Cst ℄ Sta 10+00.00= Mohave Dr Cst ℄ Sta 196+58.00

Exst I-40 Cst ℄ Sta 2962+00±, Rt Bgn Conc Channel

10' Bottom Width

(22) CURVE DATA
PI Sta 26+81.73
Main Curve
Δ=9°06'00"Lt
D=3°00'02"
R=1909.59'
L=303.29'
T=151.96'
Ext=6.04'
Super=0.044'/ft

New R/W & Access Control

322-27-028

End Mohave Dr Ramp B Cst ℄ Sta 34+33.82= Mohave Dr Cst ℄ Sta 196+70.00

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - I-40 PLAN
STA 2950+00 to 2965+00

ROUTE I-40 | LOCATION RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 6 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		7	40	

040 M0 055

(31) CURVE DATA
PI Sta 14+54.39
Main Curve
Δ=9°07'22"Rt
D=3°00'00"
R=1909.86'
L=304.99'
T=152.37'
Ext=6.07'
Super=0.034'/ft

(32) CURVE DATA
PI Sta 30+11.41
Main Curve
Δ=6°07'40"Lt
D=0°30'00"
R=11460.00'
L=1225.65'
T=613.41'
Ext=16.41'
Super=nc

322-12-003

New 10' Utility Easement

New R/W & Access Control

PT 16+06.11

Exst Communication Utility Line (TI Carrier) To Be Relocated

25:1 Taper

Mohave Dr Ramp C Cst ℄

PC 23+98.00

10' Exst Utility Easement

Exst R/W & Access Control

Mohave Dr Ramp C Cst ℄ Sta 28+73.56= 102.54'Lt I-40 Cst ℄ Sta 2977+85.46
Nose Control Point

Exst WB Rattlesnake Wash Bridge
Widen Lt
Replace Barrier Rt

Exst Guard Rail
Remove, Install New Guard Rail

Wash

Exst I-40 Cst ℄

Exst R/W

Exst Cable Barrier To Remain

Sawcut

Bridge

Sta 2967+49±
Exst 6' x 7' CBC
Plug & Abandon, Construct New Catch Basin

Exst EB Rattlesnake Wash Bridge
Widen Rt
Replace Barrier Lt

Exst R/W & Access Control

Exst Guard Rail
Remove, Install New Guard Rail

Mohave Dr Ramp D Cst ℄

PC 19+85.54

New R/W & Access Control

Rattlesnake

Exst I-40 Cst ℄
Sta 2968+83±, Rt
End Conc Channel
10' Bottom Width

Mohave Dr Ramp D Cst ℄ Sta 25+26.42= 93.52'Rt, I-40 Cst ℄ Sta 2975+73.05
Nose Control Point

322-01-078

(41) CURVE DATA
PI Sta 25+54.68
Main Curve
Δ=5°41'11"Rt
D=0°30'00"
R=11460.00'
L=1137.34'
T=569.14'
Ext=14.12'
Super=nc

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - I-40 PLAN
STA 2965+00 to 2980+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN
DWG NO: 7 OF 40
TRACS NO. H6814 01L

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		8	40	

040 M0 055

32 CURVE DATA

PI Sta 30+11.41

Main Curve
Δ=6°07'40"Lt
D=0°30'00"
R=11460.00'
L=1225.65'
T=613.41'
Ext=16.41'
Super=nc

322-12-003

End Mohave Dr Ramp C Cst ℄ Sta 36+23.65=
78.00'Lt I-40 Cst ℄ Sta 2985+35.01

New 10'
Utility Easement

New R/W &
Access Control

Exst Communication
Utility Line (TI Carrier)
To Be Relocated

Mohave Dr Ramp C Cst ℄

35

Exst R/W &
Access Control

Exst I-40 Cst ℄
Sta 2989+00, 88.0'Lt
Bgn Pvmt Taper

Exst Communication
Utility Line (TI Carrier)
To Remain

Sta 2992+00±
Exst 6'x 7' CBC
Extend Rt

Exst I-40 Cst ℄
Sta 2992+00, 76.0'Lt
End Pvmt Taper

10' Exst
Utility Easement

2980 2985 2990 2995

Exst Guard Rail
Remove, Install New
Guard Rail

Exst I-40 Cst ℄

25:1 Taper

74' Sawcut 88'

32

Exst Cable Barrier
To Remain

41

74' Sawcut 88'

154' Exst R/W
22' 12' 10'
108' 54' 54'
16' 12' 4'

50:1 Taper

Exst Guard Rail
Remove, Install New
Guard Rail

30

New R/W &
Access Control

End Mohave Dr Ramp D Cst ℄ Sta 31+22.88=
78.00'Rt I-40 Cst ℄ Sta 2981+69.25

Exst R/W &
Access Control

322-01-078

Exst I-40 Cst ℄
Sta 2989+00, 88.0'Rt
Bgn Pvmt Taper

Exst I-40 Cst ℄
Sta 2995+00, 76.0'Rt
End Pvmt Taper

Rattlesnake Wash

Mohave Dr Ramp D Cst ℄

Exst EB Rattlesnake
Wash Bridge
Widen Rt
Replace Barrier Lt

41 CURVE DATA

PI Sta 25+54.68

Main Curve
Δ=5°41'11"Rt
D=0°30'00"
R=11460.00'
L=1137.34'
T=569.14'
Ext=14.12'
Super=nc

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - I-40 PLAN
STA 2980+00 to 2995+00

ROUTE I-40 | LOCATION RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 8 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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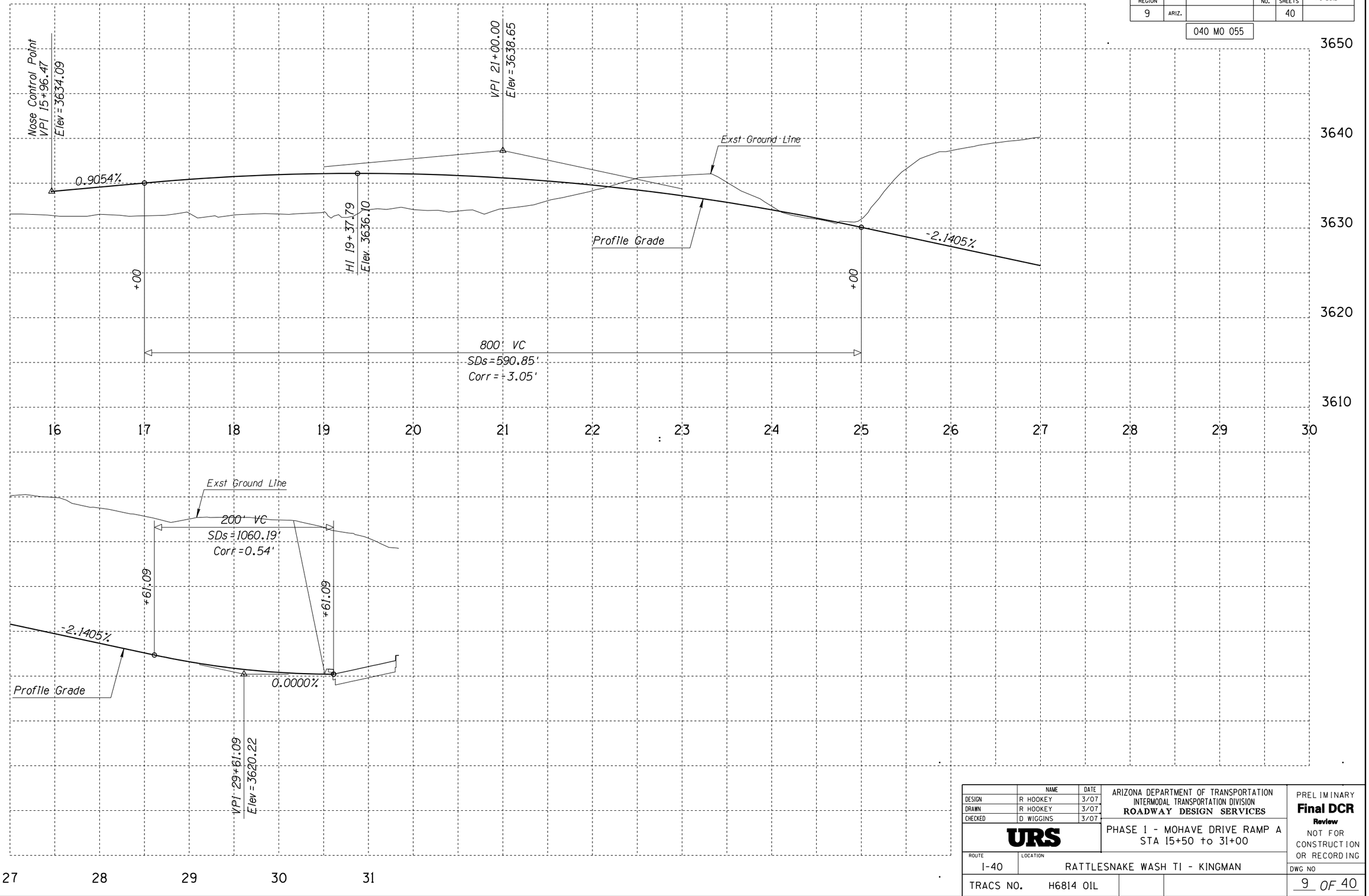
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.			40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - MOHAVE DRIVE RAMP A
STA 15+50 to 31+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
9 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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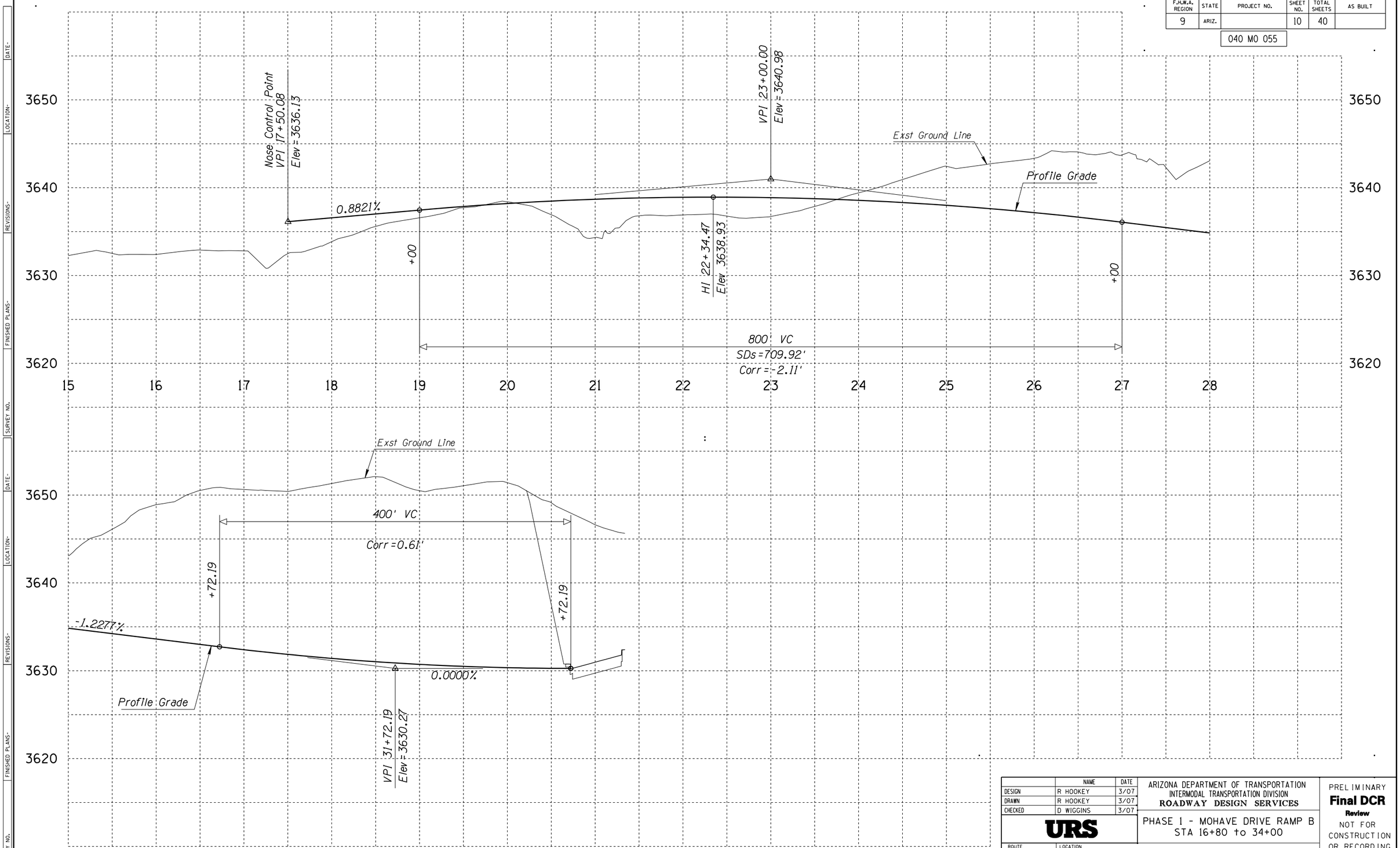
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		10	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DRIVE RAMP B
STA 16+80 to 34+00

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
10 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE- | SURVEY

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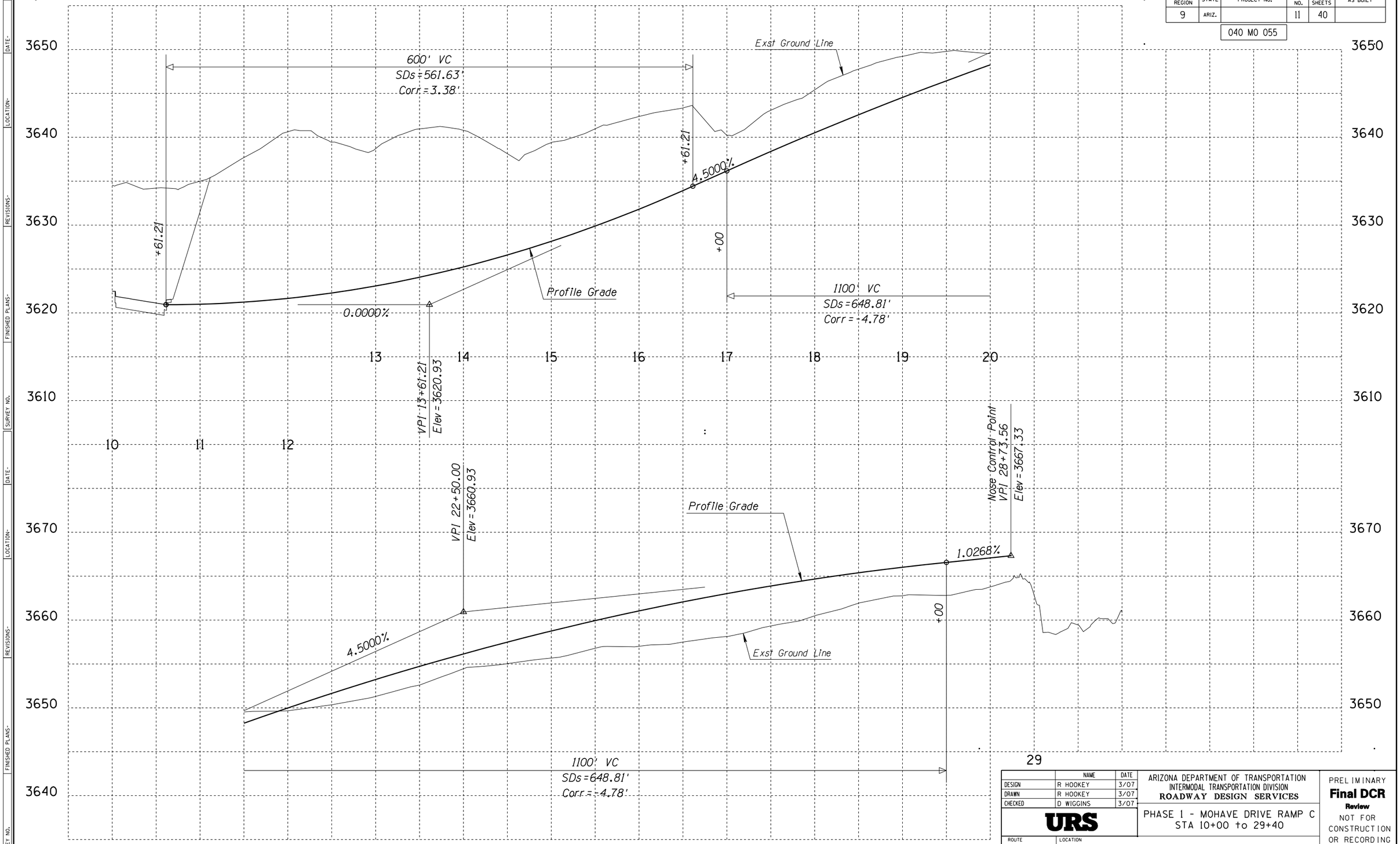
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		11	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DRIVE RAMP C
STA 10+00 to 29+40

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
11 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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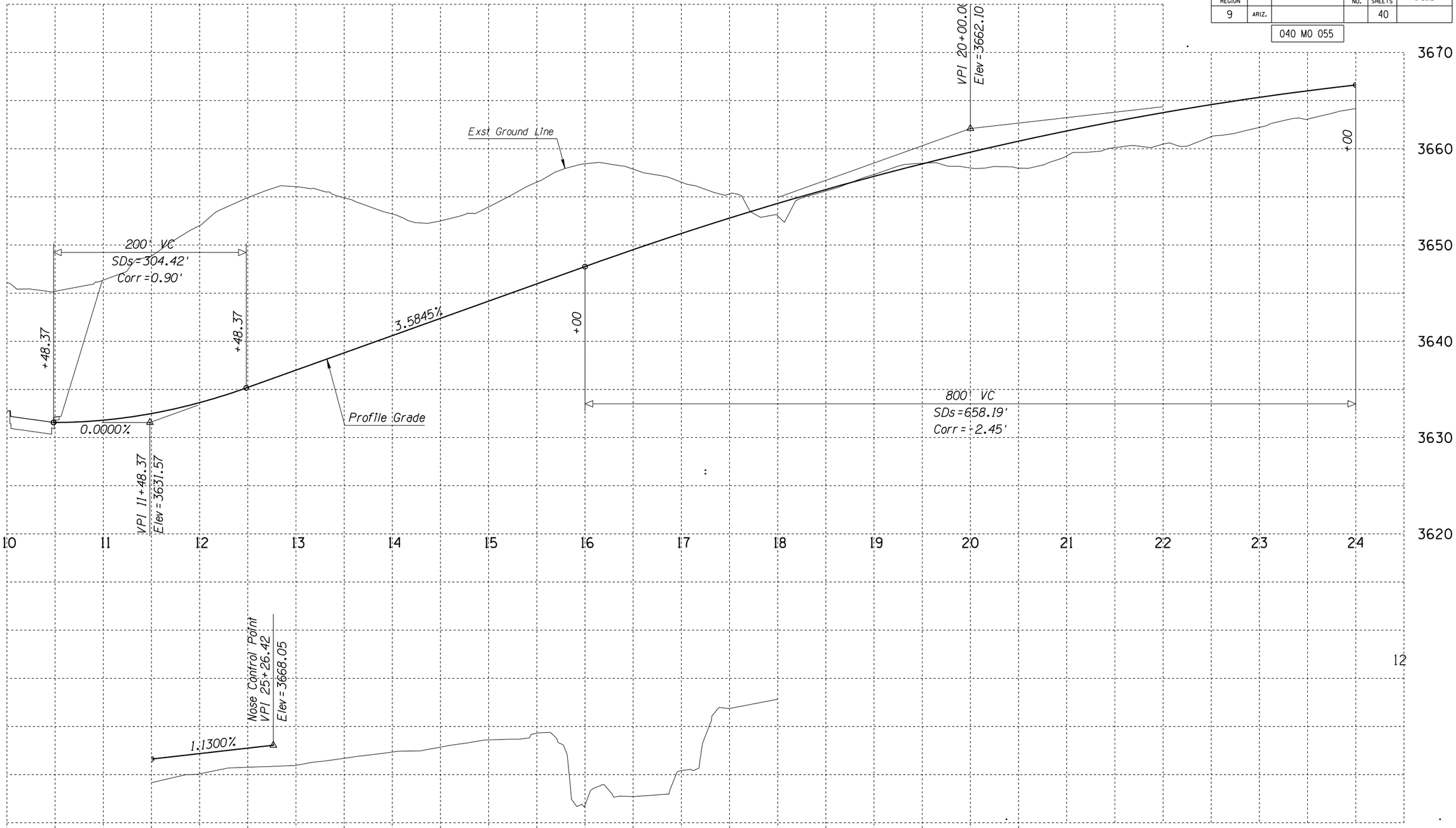
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.			40	

040 M0 055

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DRIVE RAMP D
STA 10+40 to 24+60

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
12 OF 40

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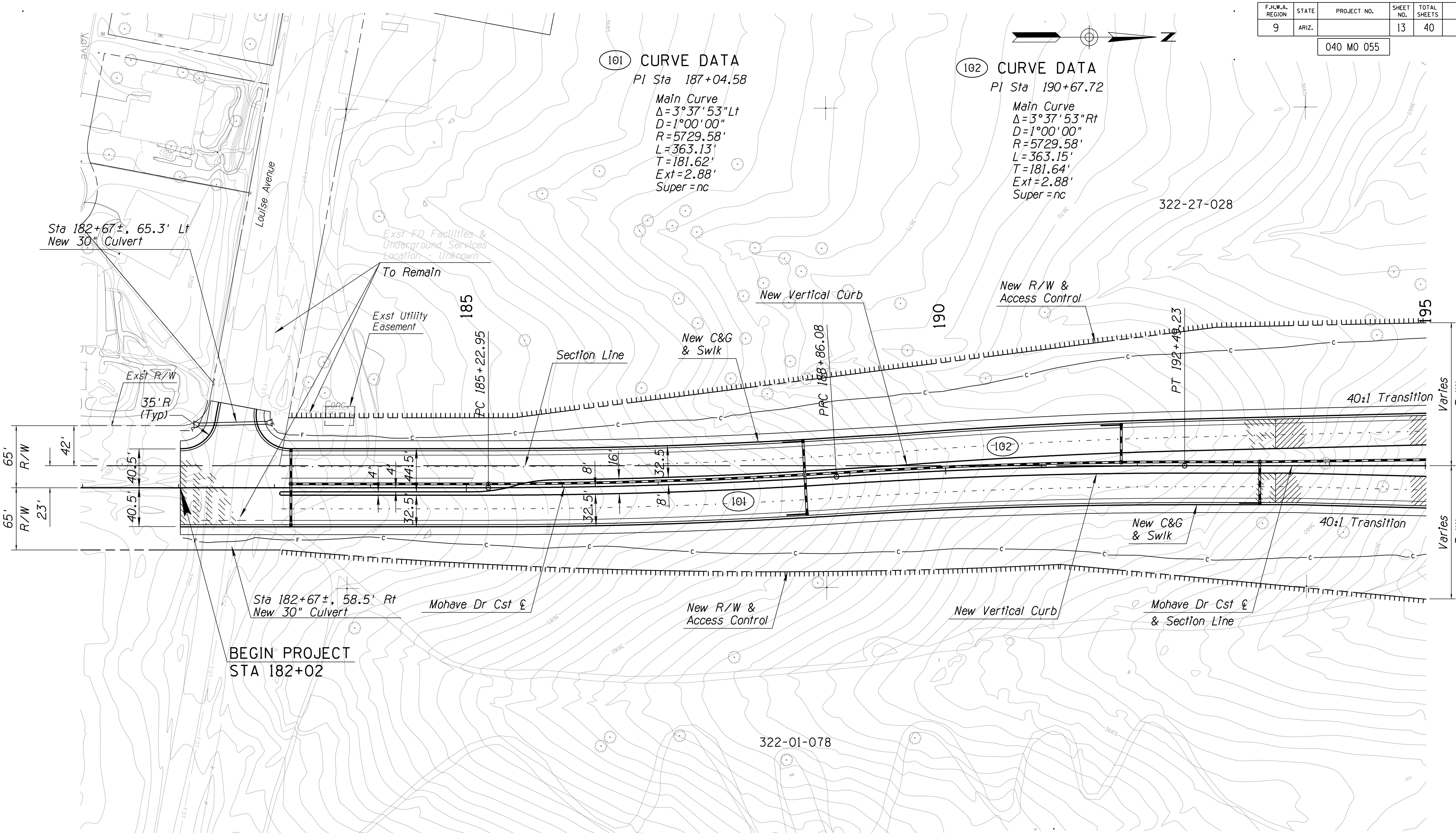
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		13	40	

040 MO 055



N
101 CURVE DATA
PI Sta 187+04.58
Main Curve
Δ=3°37'53"Lt
D=1°00'00"
R=5729.58'
L=363.13'
T=181.62'
Ext=2.88'
Super=nc
102 CURVE DATA
PI Sta 190+67.72
Main Curve
Δ=3°37'53"Rt
D=1°00'00"
R=5729.58'
L=363.15'
T=181.64'
Ext=2.88'
Super=nc
322-27-028
Louise Avenue
Sta 182+67±, 65.3' Lt
New 30" Culvert
Exst FO Facilities & Underground Services Location - Unknown
To Remain
Exst Utility Easement
185
PC 185+22.95
Section Line
New C&G & Swlk
New Vertical Curb
PRC 188+86.08
190
New R/W & Access Control
PT 192+49.23
195
Exst R/W
35'R (Typ)
Conc.
65'
R/W
42'
40.5'
23'
4'
44.5'
32.5'
8'
16'
101
102
40:1 Transition
Varies
New C&G & Swlk
Sta 182+67±, 58.5' Rt
New 30" Culvert
Mohave Dr Cst ℄
New R/W & Access Control
New Vertical Curb
Mohave Dr Cst ℄ & Section Line
BEGIN PROJECT
STA 182+02
322-01-078

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 181+00 to 195+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

DWG NO 13 OF 40

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		14	40	

040 M0 055

-3.2000%

VPI 184+50.00
Elev=3694.00

+50

400' VC
SDs=585.41'
Corr=-1.40'

+50

-6.0000%

Exst Ground Line

Profile Grade

+00

600' VC
SDs=880.00'
Corr=2.25'

+00

VPI 192+00.00
Elev=3649.00

-3.0000%

3715 3710 3705 3700 3695 3690 3685 3680 3675 3670 3665 3660 3655 3650 3645 3640 3635 3630 3625 3620

181 182 183 184 185 186 187 188 189 190 191 192 193 194 195

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 181+00 to 195+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
14 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		15	40	

040 M0 055

End Mohave Dr Ramp B Cst ℄ Sta 34+33.82 =
Mohave Dr Cst ℄ Sta 196+70.00

New 60" Storm Drain

Exst I-40 Cst ℄ Sta 2959+84.37 =
Mohave Dr Cst ℄ Sta 200+00.00

322-27-028

322-27-001

Exst Communication
Utility Line (T1 Bundles)
To Be Relocated

322-08-058

New R/W

60'

Future Kaibab Road

End Mohave Dr Ramp A Cst ℄ Sta 31+33.91 =
Mohave Dr Cst ℄ Sta 202+42.00

New R/W &
Access Control

322-08-057

New R/W &
Access Control

New
Vertical Curb

New C&G
& Swlk

New C&G
& Swlk

New Vertical Curb

New 84"
Storm Drain

New 78"
Storm Drain

40:1 Transition

195

200

205

3'

30

PI 207+12.55

Section Corner

40:1 Transition

Varies
R/W

56.5'

6'

3'

3'

60

40:1 Transition

New C&G
& Swlk

New C&G
& Swlk

New C&G
& Swlk

New 84" Storm Drain

Varies
R/W

80'

Mohave Dr Cst ℄
& Section Line

New R/W &
Access Control

322-09-001

New R/W

322-01-078

Exst I-40 Cst ℄

Bgn Mohave Dr Ramp D Cst ℄ Sta 10+00.00 =
Mohave Dr Cst ℄ Sta 196+58.00

Bgn Mohave Dr Ramp D Cst ℄ Sta 10+00.00 =
Mohave Dr Cst ℄ Sta 202+30.00

PC 13+02.02

322-12-003

Future Access Road
to Parcel 322-12-003
To Be Constructed
By Others

Section Line

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 195+00 to 209+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 OIL

DWG NO
15 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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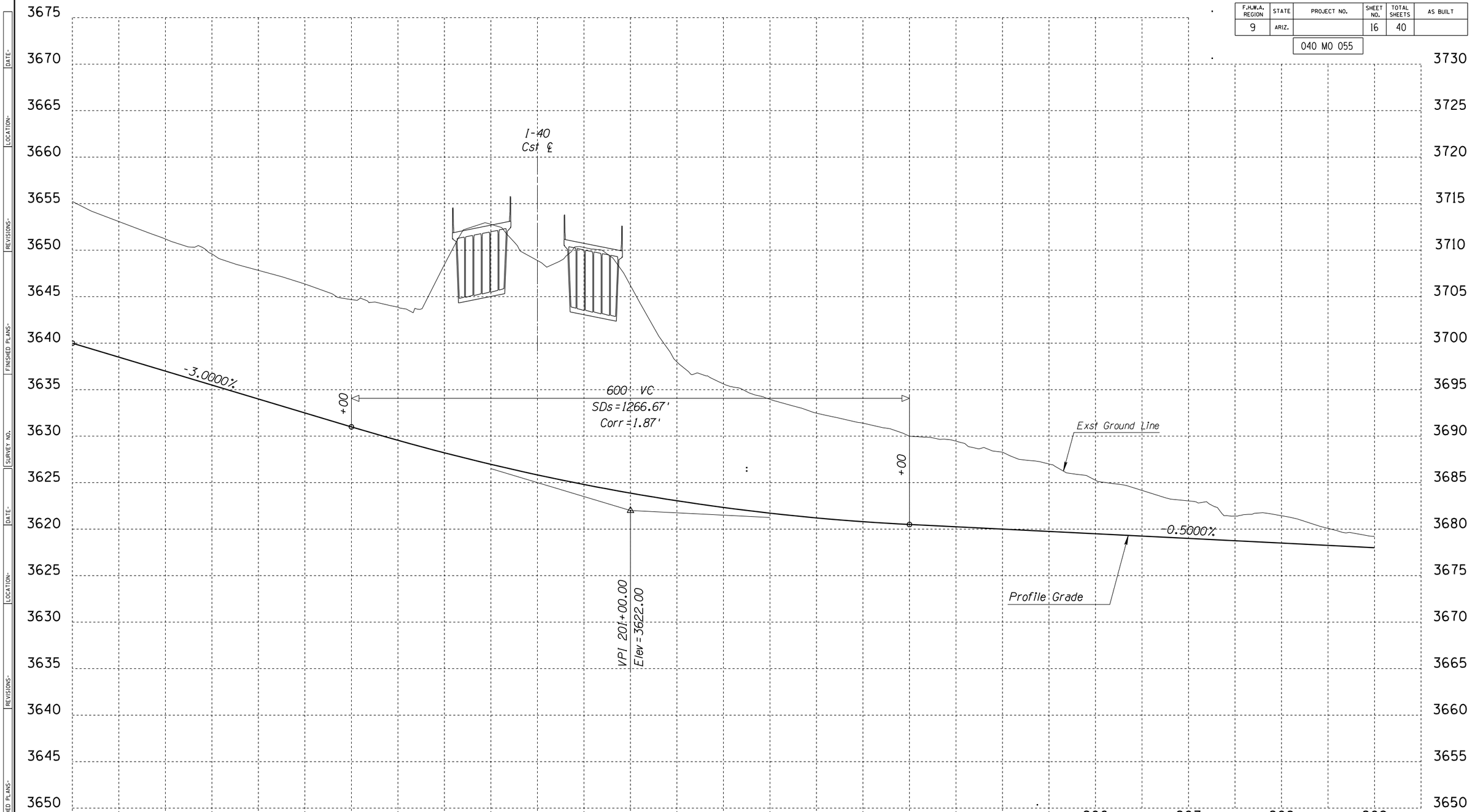
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		16	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 195+00 to 209+00

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
16 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		17	40	

040 M0 055

322-08-058 322-08-055 322-08-042 322-08-042

Future Lamar Road

Tube Tank Valve

New R/W 60' New R/W

322-08-057 322-08-056 322-08-041 322-08-041 322-08-025

Future Grand Canyon Road

210 215 220

New R/W & Access Control

New 84" Storm Drain

New C&G & Swlk

New Vertical Curb

New Drainage Easement

New 84" Storm Drain

New R/W

Exst R/W

40:1 Transition

Exst R/W

Exst R/W

Varies R/W

34' 44.5' 8' 8' 44.5' 16' 34' 34'

20' Slope Esmt

65' R/W

20' Slope Esmt

New R/W & Access Control

New C&G & Swlk

New 36" Storm Drain

Sta 213+25 to 223+00 New V-Ditch

60

New R/W

Mohave Dr Cst ℄ & Section Line

New Drainage Easement

Future Access Road to Parcel 322-12-003

To Be Constructed By Others

322-09-001

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 209+00 to 223+00

ROUTE I-40 LOCATION RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 17 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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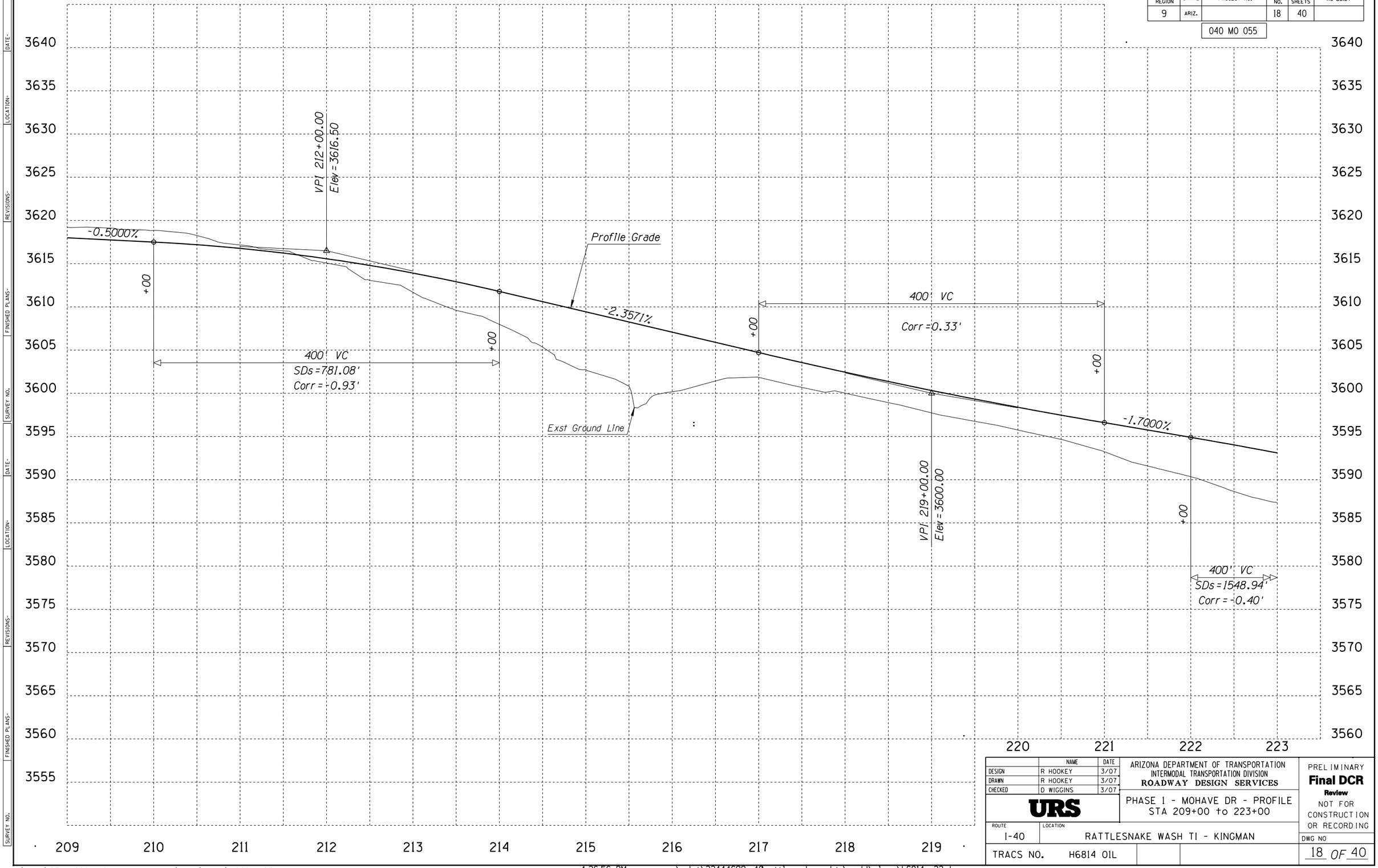
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		18	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I - MOHAVE DR - PROFILE
STA 209+00 to 223+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	18 OF 40

TRACS NO. H6814 0IL

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		19	40	

040 M0 055

N

322-08-025

322-08-024

Future Painted Desert Road

322-08-009

322-08-008

Future Diamond Joe Road

322-16-008

New Drainage Easement

New Drainage Easement

225

230

235

New R/W

New C&G & Swlk

New Vertical Curb

New R/W

2-30" Culverts

New R/W

Exst R/W

Exst R/W

20' Slope Esmt

65' R/W

65' R/W

20' Slope Esmt

34'

44.5'

8'

8'

44.5'

16'

34'

50'

2-42" Culverts

New C&G & Swlk

New R/W

Mohave Dr Cst ℄ & Section Line

New Drainage Easement

Exst R/W

New R/W

322-09-001

322-09-002

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 223+00 to 237+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

DWG NO
19 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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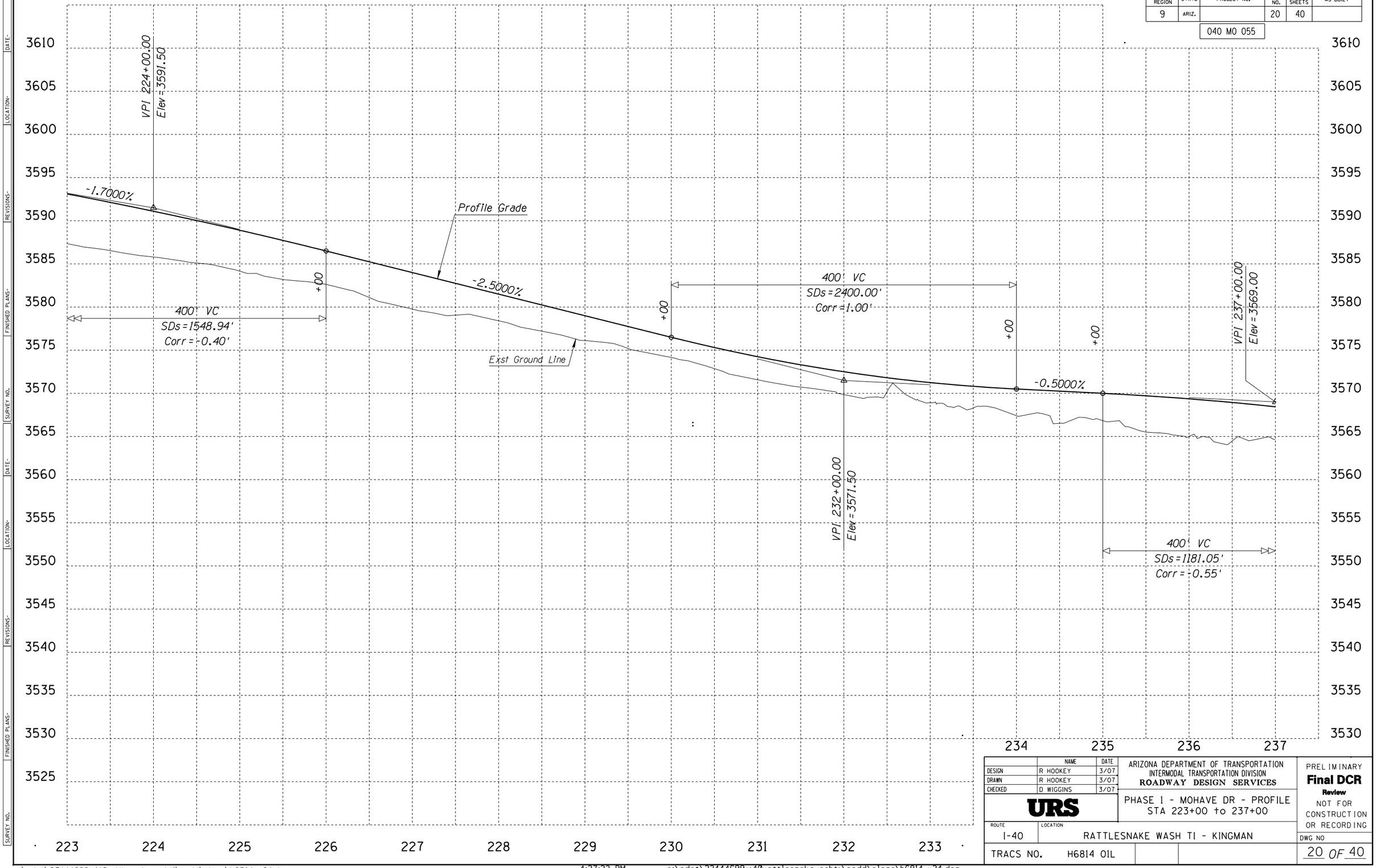
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		20	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 223+00 to 237+00

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 OIL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
20 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		21	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

322-16-008

322-16-001

322-09-002

New R/W

Rattlesnake Wash
Channel Improvements

Rattlesnake Wash

116'

116'

62' Bottom Width

Sta 240+90±
New 5-12' x 9' CBC

240

245

250

Sta 245+30±
New 24" Culvert

New Vertical Curb

New C&G
& Swlk

New R/W

20' Slope Esmt

65' R/W

20' Slope Esmt

50'

44.5'

8'

16'

8'

44.5'

8'

Exst R/W

New R/W

Mohave Dr Cst ℄
& Section Line

New C&G
& Swlk

Sta 243+50 to 251+00, Rt
New V-Ditch

New R/W

116'

62' Bottom Width

116'

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 237+00 to 251+00

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
21 OF 40

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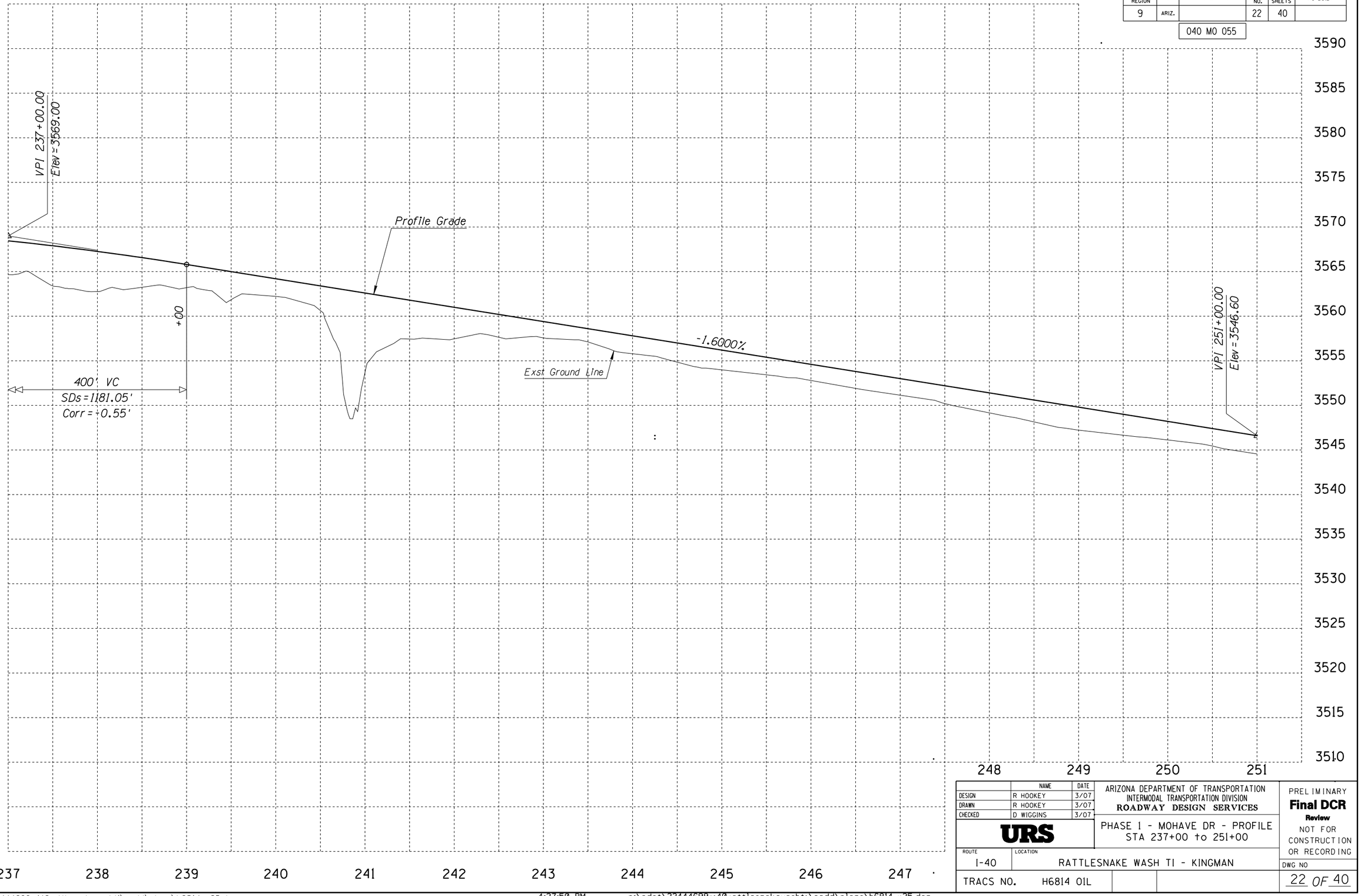
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		22	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 237+00 to 251+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	22 OF 40

TRACS NO. H6814 01L

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		23	40	

040 M0 055

21

322-16-001

322-03-001

322-09-002

322-01-075

Exst R/W

Airway Avenue

New Drainage Easement

42' 42'

PI 259+95.68

Exst Fiber Optic Line Approximate Location To Remain

20' Slope Esmt

New R/W

New Vertical Curb

New C&G & Swlk

Exst R/W

40'R (Typ)

10:1 Taper

50:1 Transition

25:1 Taper

65' R/W

44.5'

8'

16'

4'

48'

10'

34'

14.5'

68.5'

50'

Mohave Dr Cst ℄ & Section Line

Sta 251+00 ro 259+10, Rt New V-Ditch

Construct Graded Connector Road

New TCE

50' 50'

Section Line

Note: Storm Drain 24" Dia Unless Noted Otherwise

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - MOHAVE DR - PLAN
STA 251+00 to 265+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

DWG NO 23 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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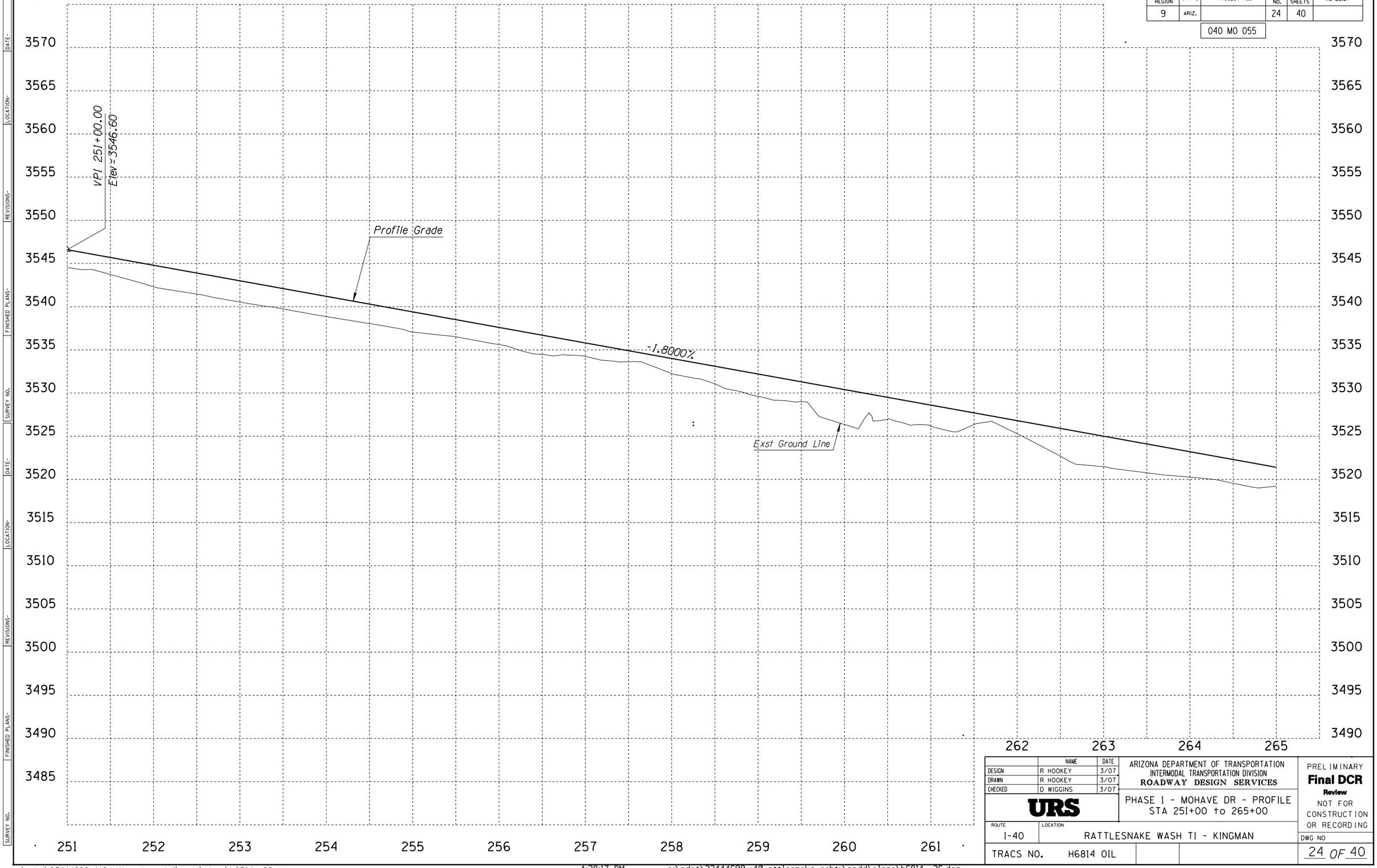
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		24	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I - MOHAVE DR - PROFILE
STA 251+00 to 265+00

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
24 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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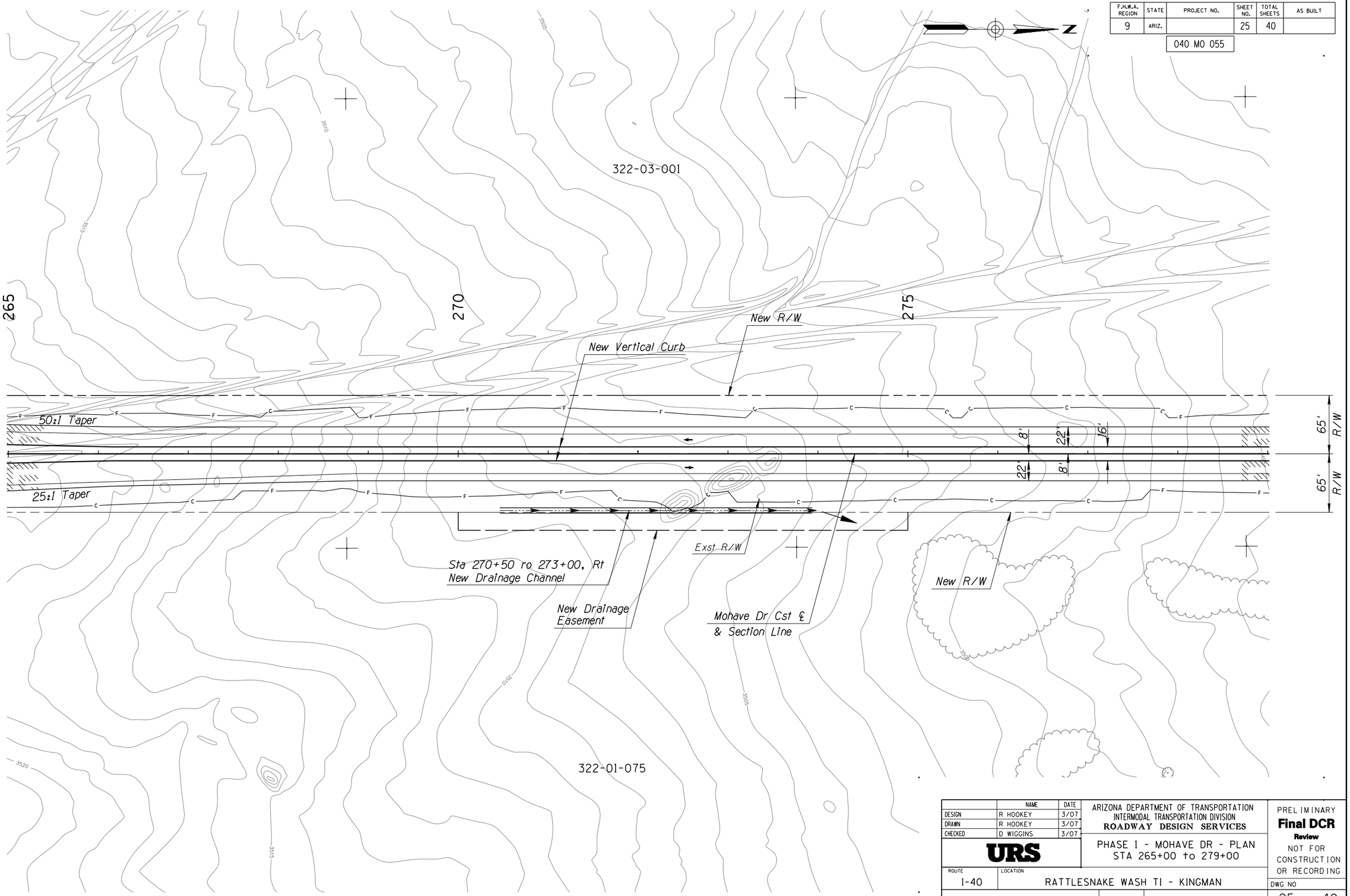
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		25	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 265+00 to 279+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN
TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
25 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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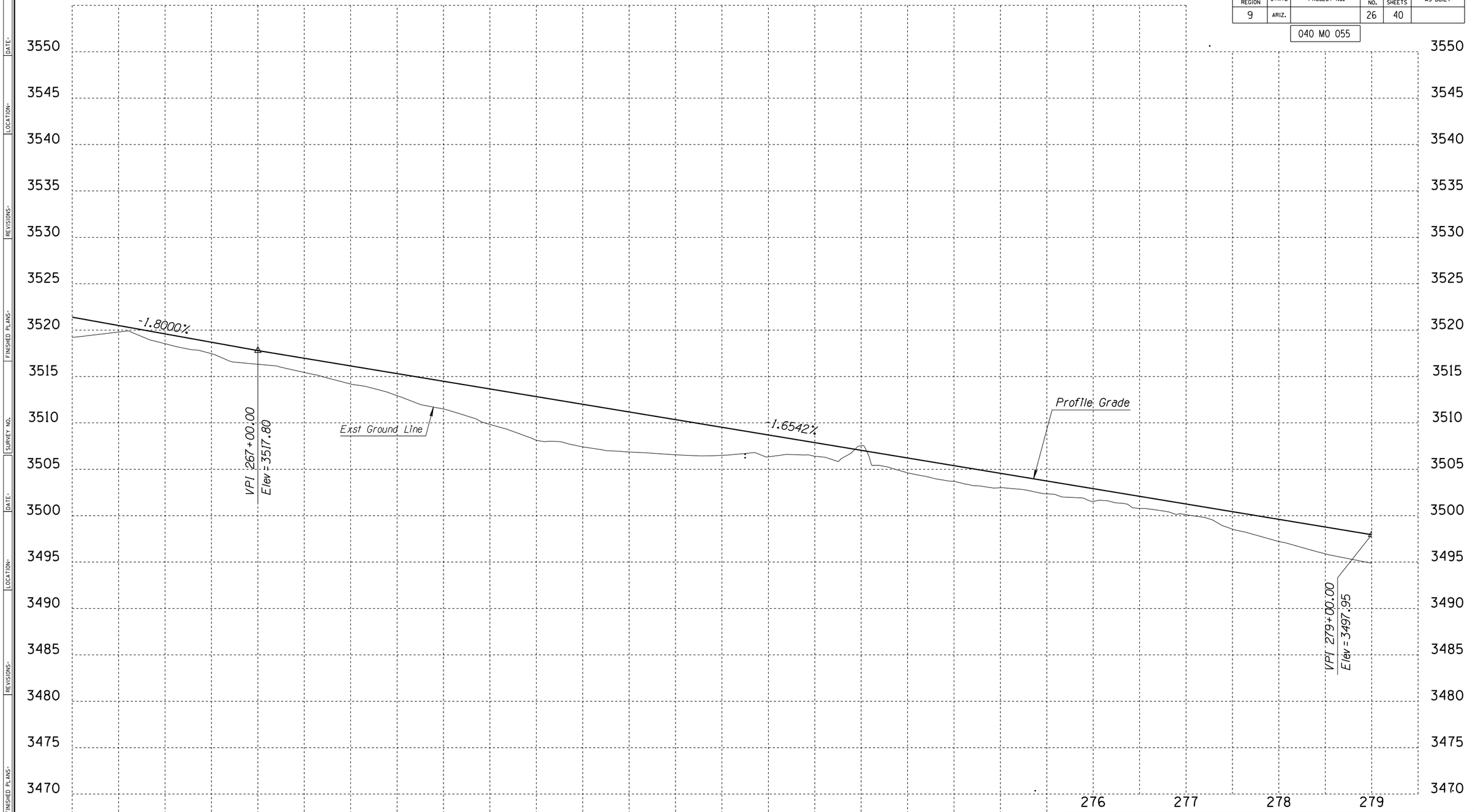
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		26	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - MOHAVE DR - PROFILE
STA 265+00 to 279+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	
TRACS NO.	H6814 OIL	26 OF 40

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		27	40	

040 M0 055

N

322-03-001

280

285

290

New R/W

New Vertical Curb

8'

22'

16'

22'

8'

65' R/W

65' R/W

New R/W

Mohave Dr Cst ℄
& Section Line

322-01-075

N 1540500

N 1540

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 279+00 to 293+00

ROUTE: I-40

LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO

27 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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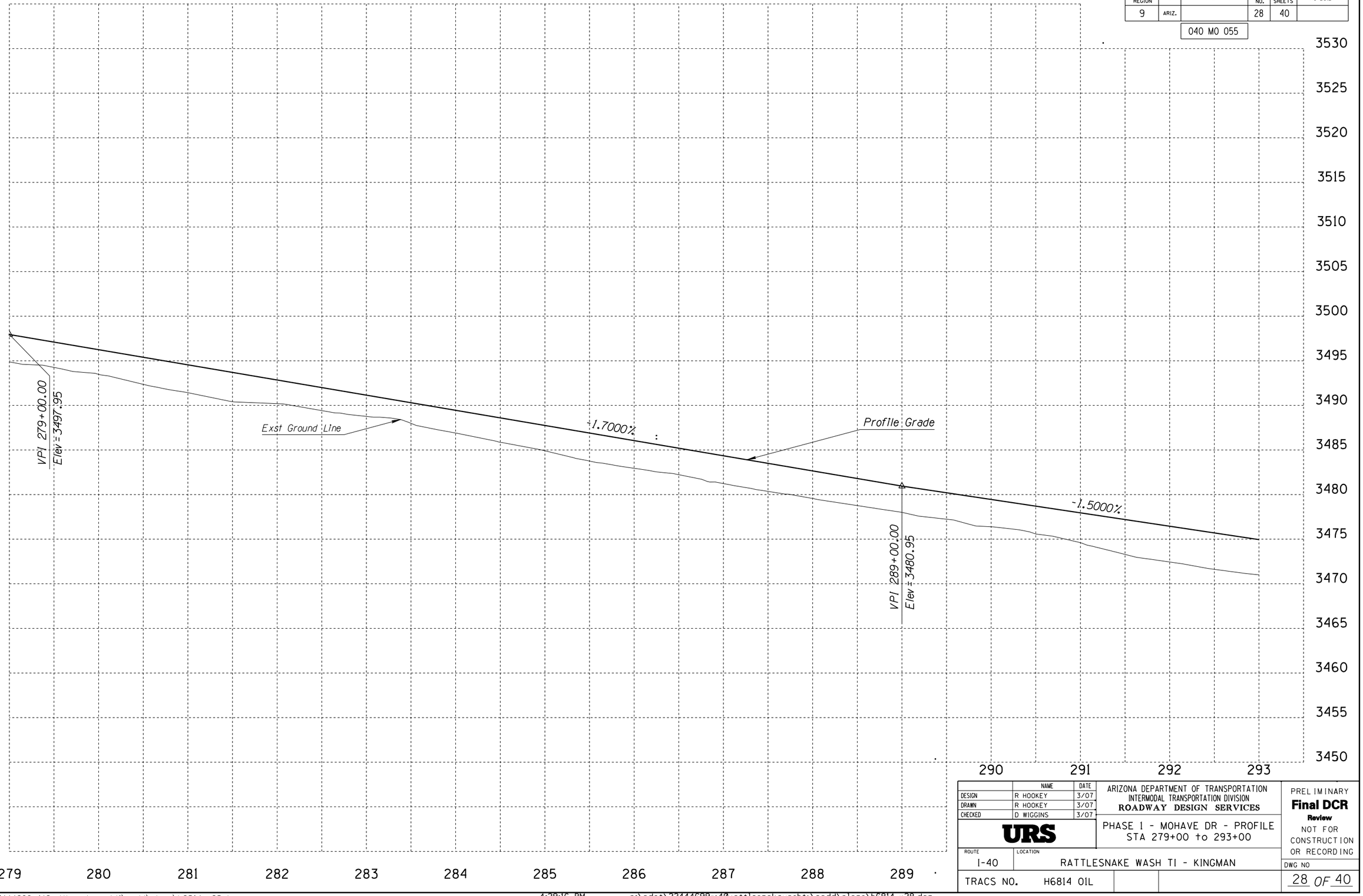
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		28	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I - MOHAVE DR - PROFILE
STA 279+00 to 293+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
28 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		29	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

N

(103) CURVE DATA

PI Sta 310+16.68

Main Curve
Δ = 26°35'38" Left
D = 1°00'00"
R = 5729.58'
L = 2659.40'
T = 1354.10'
Ext = 157.84'
Super = nc

322-03-001

322-15-001

295

300

305

PC 296+62.59

New R/W

New Vertical Curb

New Drainage Easement

Mohave Dr Cst ℄

65' R/W

65' R/W

8'

22'

16'

22'

8'

103

Mohave Dr Cst ℄ & Section Line

New R/W

New Drainage Easement

Sta 300+61±
New 24" Culvert

Exst R/W

Mid-Section Line

322-01-075

N 1541000

N 1541500

N 1542000

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 293+00 to 307+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

DWG NO

TRACS NO. H6814 01L

29 OF 40

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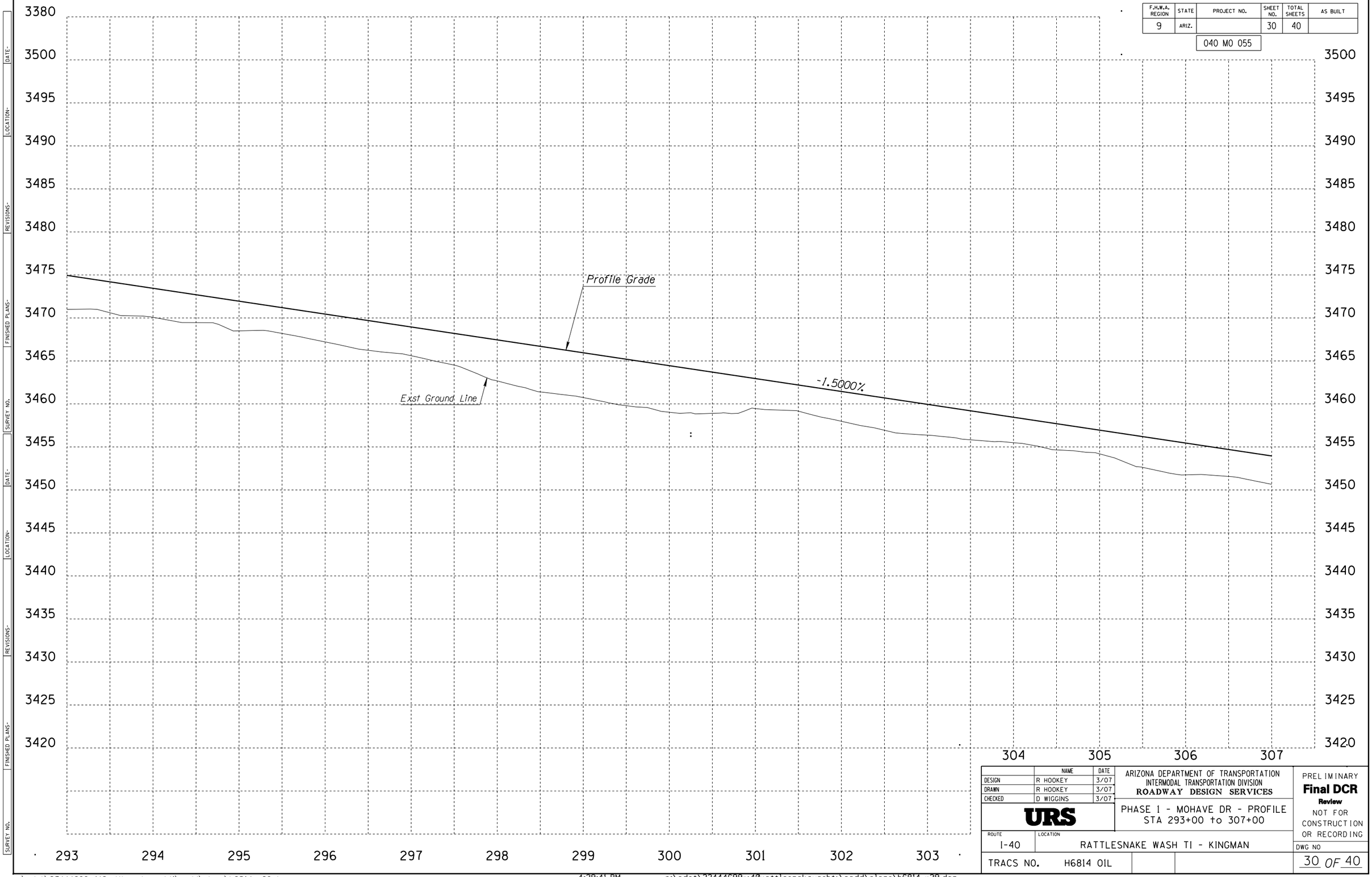
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		30	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I - MOHAVE DR - PROFILE
STA 293+00 to 307+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

DWG NO 30 OF 40

TRACS NO. H6814 0IL

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		31	40	

040 M0 055

103 CURVE DATA

PI Sta 310+16.68

Main Curve
Δ=26°35'38" Left
D=1°00'00"
R=5729.58'
L=2659.40'
T=1354.10'
Ext=157.84'
Super=nc

322-15-001

324-13-007

Exst Coal Survey Line
To Remain

310

315

320

New R/W

New Vertical Curb

Mohave Dr Cst ℄

Sta 314+00 to 321+00, Lt
New V-Ditch

65' R/W

65' R/W

8'

22'

16'

22'

8'

103

New R/W

N 1542500

N 1543000

Section Corner

322-01-075

Exst 60' Utility Easement

Exst 4" HPG
To Remain

Section Line

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 307+00 to 321+00

ROUTE: I-40

LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
31 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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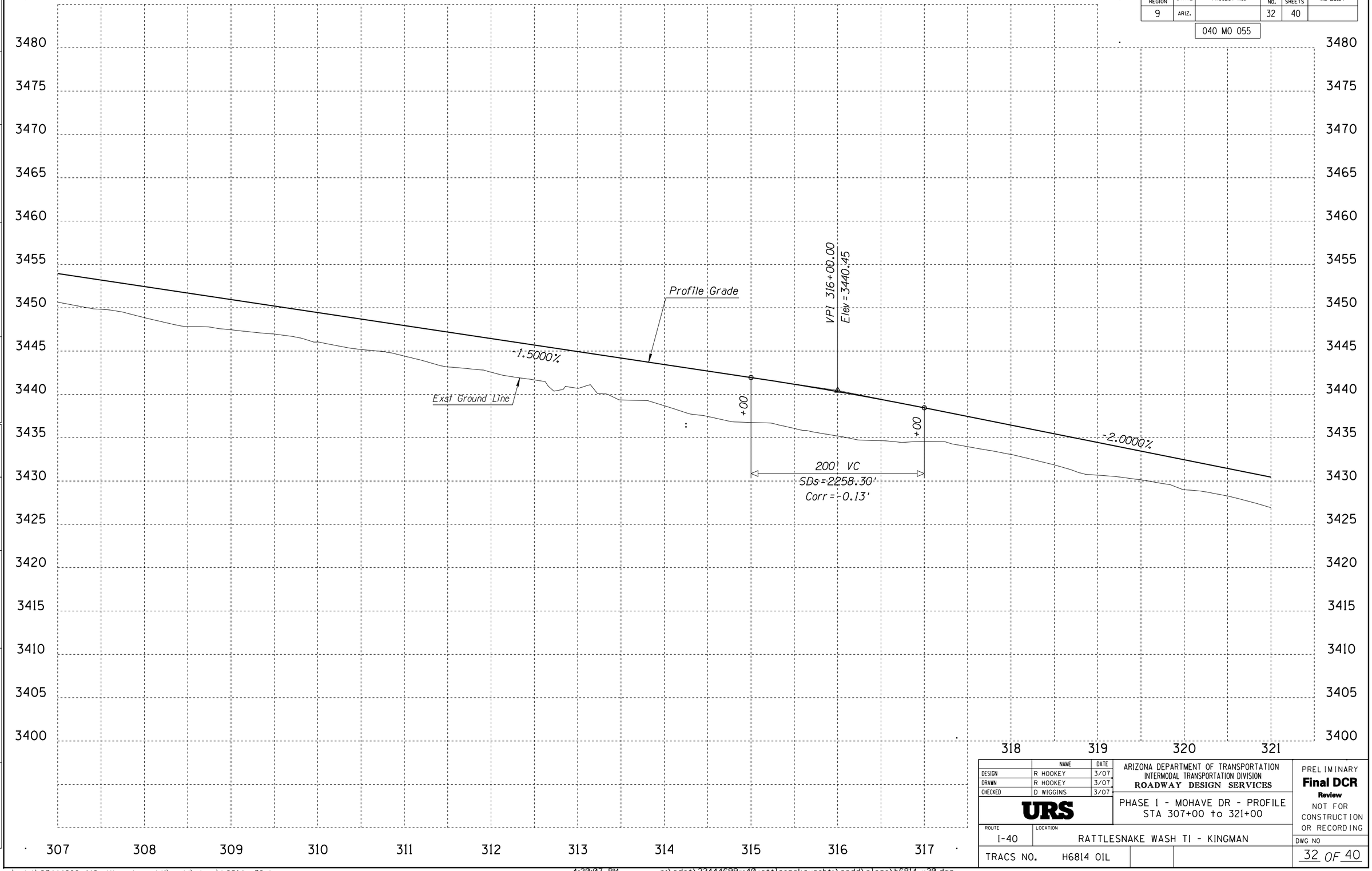
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		32	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 307+00 to 321+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
32 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		33	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | LOCATION- | REVISIONS- | DATE-

(103) CURVE DATA

PI Sta 310+16.68

Main Curve
Δ=26°35'38" Left
D=1°00'00"
R=5729.58'
L=2659.40'
T=1354.10'
Ext=157.84'
Super=nc

324-13-007

Sta 321+00 to 331+00, Lt
New V-Ditch

325

330

335

Mohave Dr Csl ℄

New Vertical Curb

PT 323+21.98

New R/W

Sta 331+41±
New 36" Culvert

10' Drainage Esmt

65' R/W

8' 22' 16'

22' 8'

(103)

65' R/W

Exst 60' Utility Easement

New R/W

Exst 4" HPG
To Remain

324-13-007

N 154

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE I- MOHAVE DR - PLAN
STA 321+00 to 335+00

ROUTE: I-40

LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
33 OF 40

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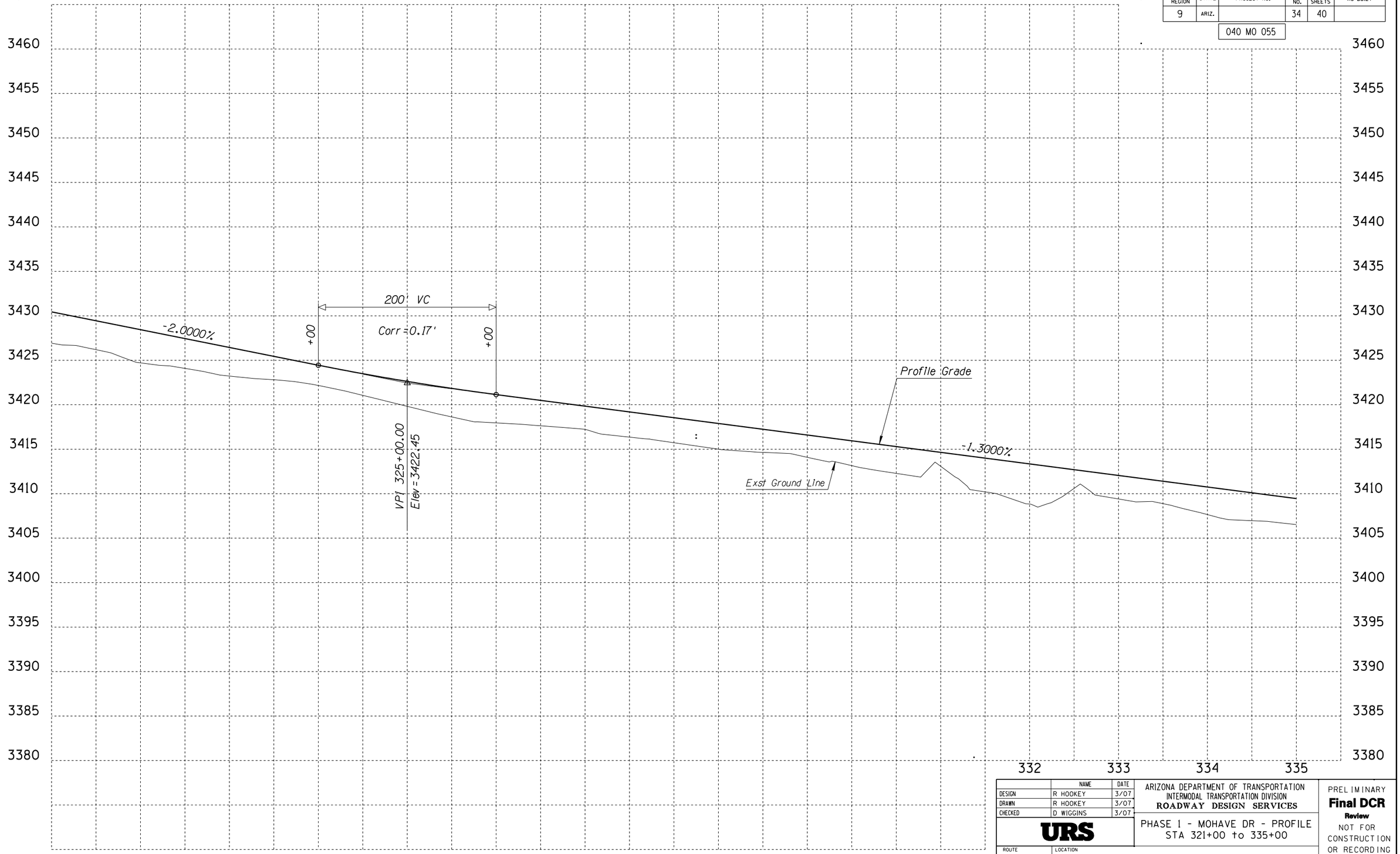
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		34	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 321+00 to 335+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
34 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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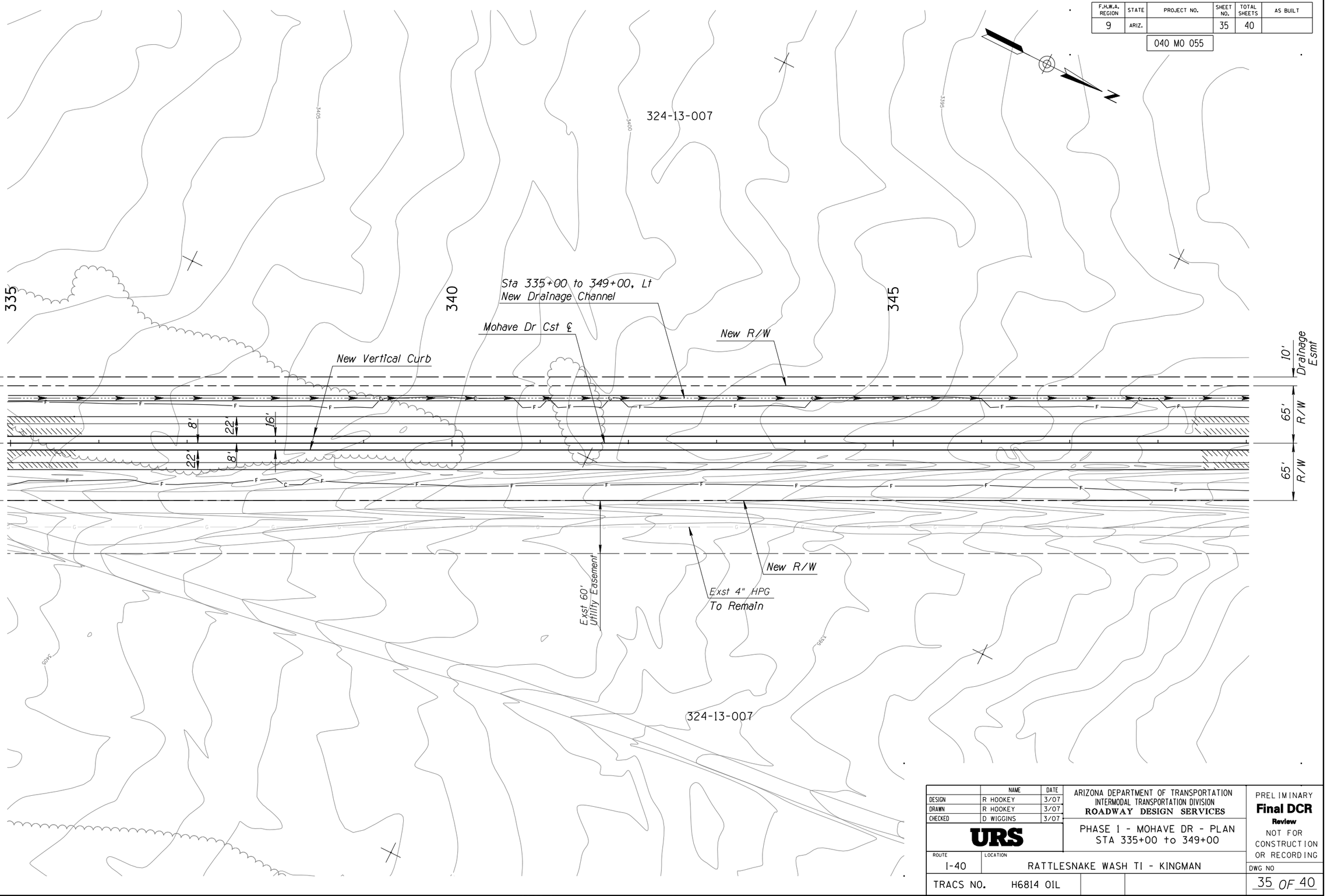
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		35	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 335+00 to 349+00

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
35 OF 40

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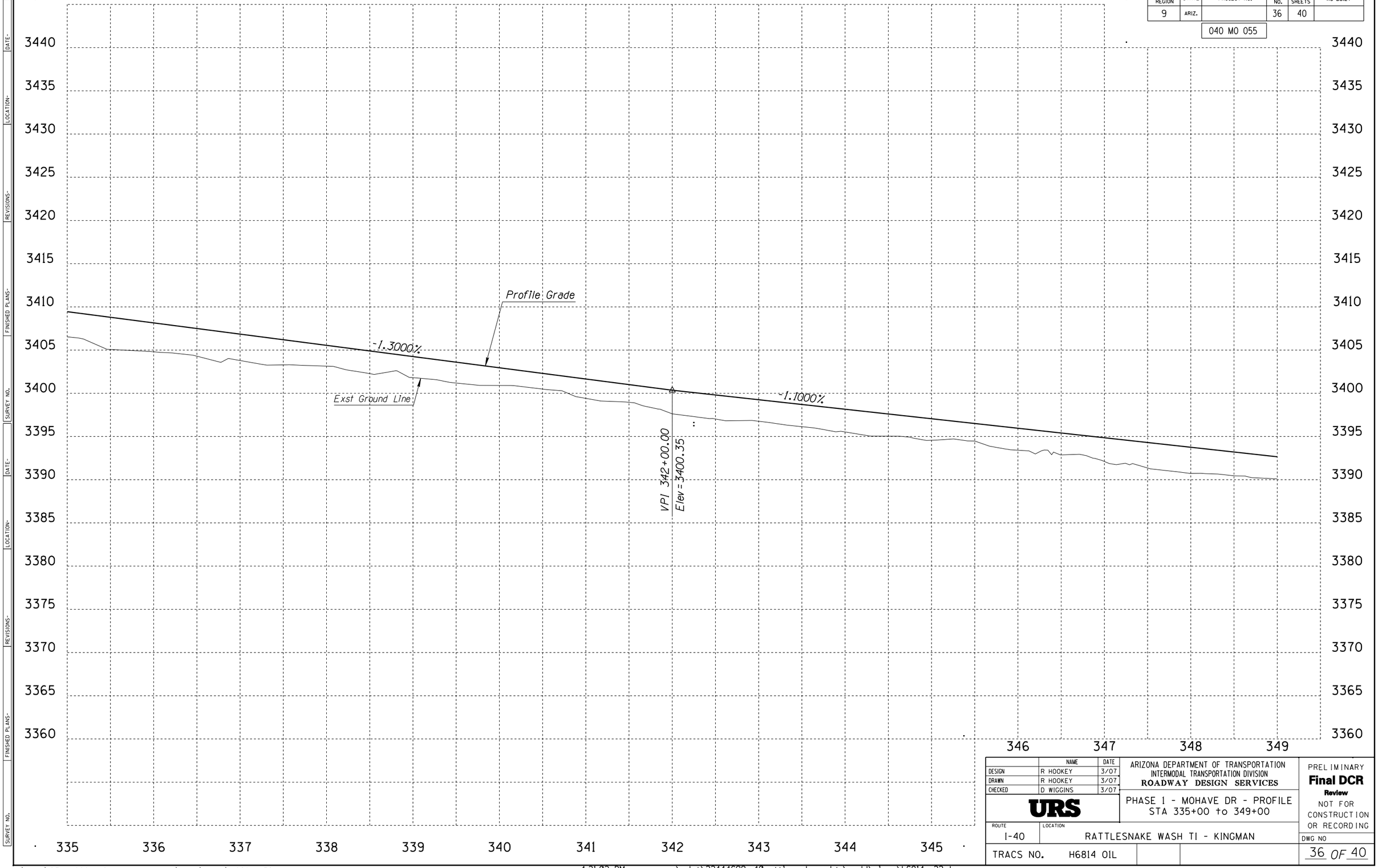
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		36	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - MOHAVE DR - PROFILE
STA 335+00 to 349+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 0IL

DWG NO
36 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		37	40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

350

355

360

324-13-007

Sta 349+00 to 363+00, Lt
New Drainage Channel

Mohave Dr Cst ℄

New R/W

New Vertical Curb

10' Drainage Esmt

65' R/W

8'

22'

16'

22'

8'

Exst 60' Utility Easement

Exst 4" HPG
To Remain

New R/W

324-13-007

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PLAN
STA 349+00 to 363+00

ROUTE: I-40

LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 OIL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
37 OF 40

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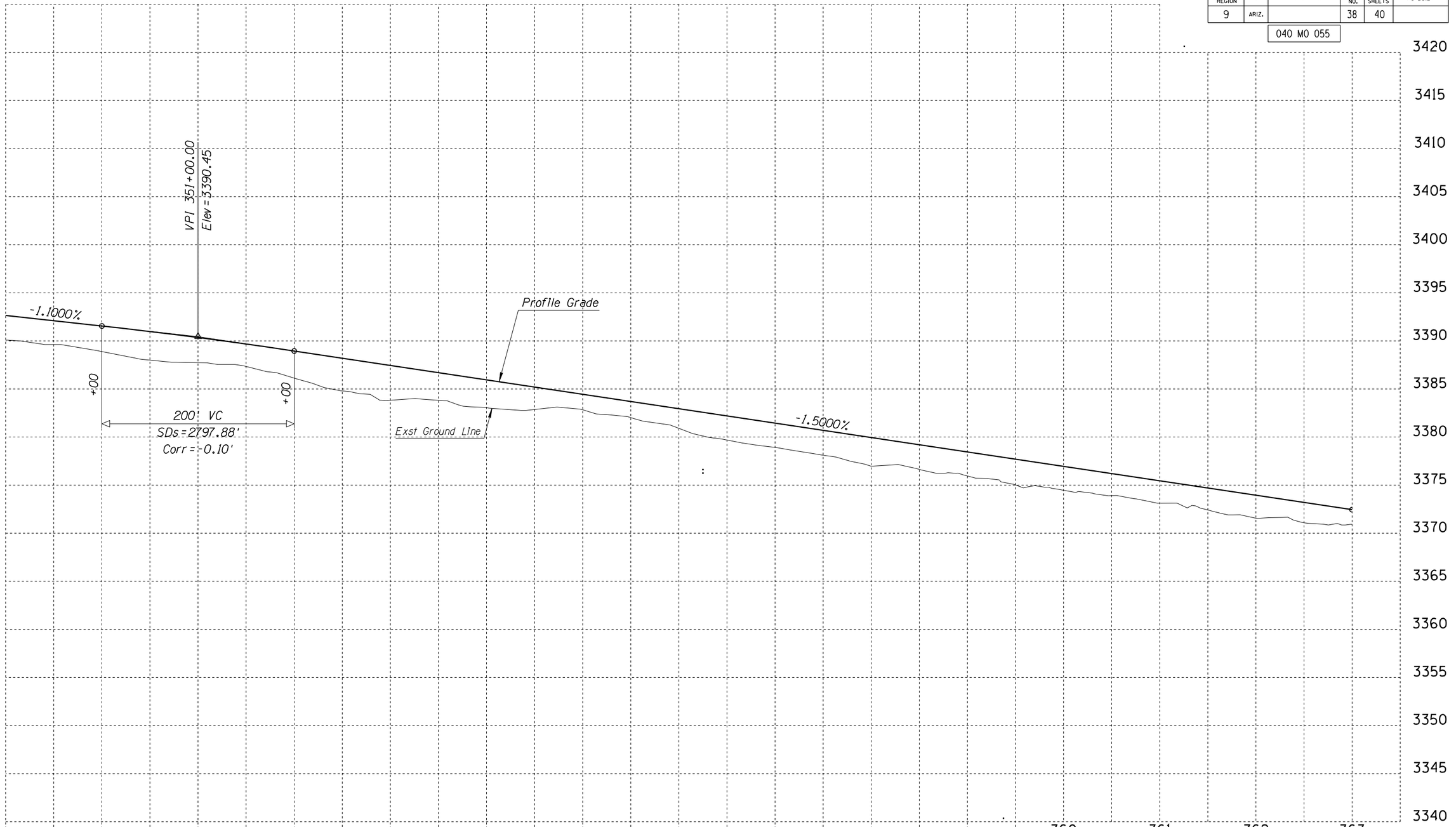
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		38	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE I - MOHAVE DR - PROFILE
STA 349+00 to 363+00

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	38 OF 40

TRACS NO. H6814 0IL

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		39	40	
		040 M0 055			

Sta 363+00 to 364+00, Lt
New Drainage Channel

10' Drainage Esmt

65' R/W

65' R/W

PC 363+99.37

365

Sta 364+00±
New 2-36" Culvert

324-13-007

N26°27'30"W

Sta 364+50 to 372+50, Lt
New V-Ditch

New R/W

370

8'

22'

22'

8'

16'

104 CURVE DATA

PI Sta 369+56.32

Main Curve
Δ=25°07'08" Lt
D=2°17'31"
R=2500.00'
L=2659.40'
T=1096.01'
Ext=61.29'
Super=nc

Sta 372+50 to 377+00, Lt
New Drainage Channel

New Vertical Curb

375

PT 374+95.38

Sta 377+00±
New 2-36" Culvert

Industrial Blvd

45' R

104

Exst 4" HPG
To Remain

324-13-007

Exst 60' Utility Easement

N51°34'38"W

45' R

New R/W

200' R

Mid-Section Line

310-01-080

32'

Match Line - See Left

Match Line - See Right

32'

310-01-080

Industrial Blvd

Match Existing AC Pavement

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 1 - MOHAVE DR - PLAN
STA 363+00 to 377+25

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-40	RATTLESNAKE WASH TI - KINGMAN

DWG NO
39 OF 40

TRACS NO. H6814 01L

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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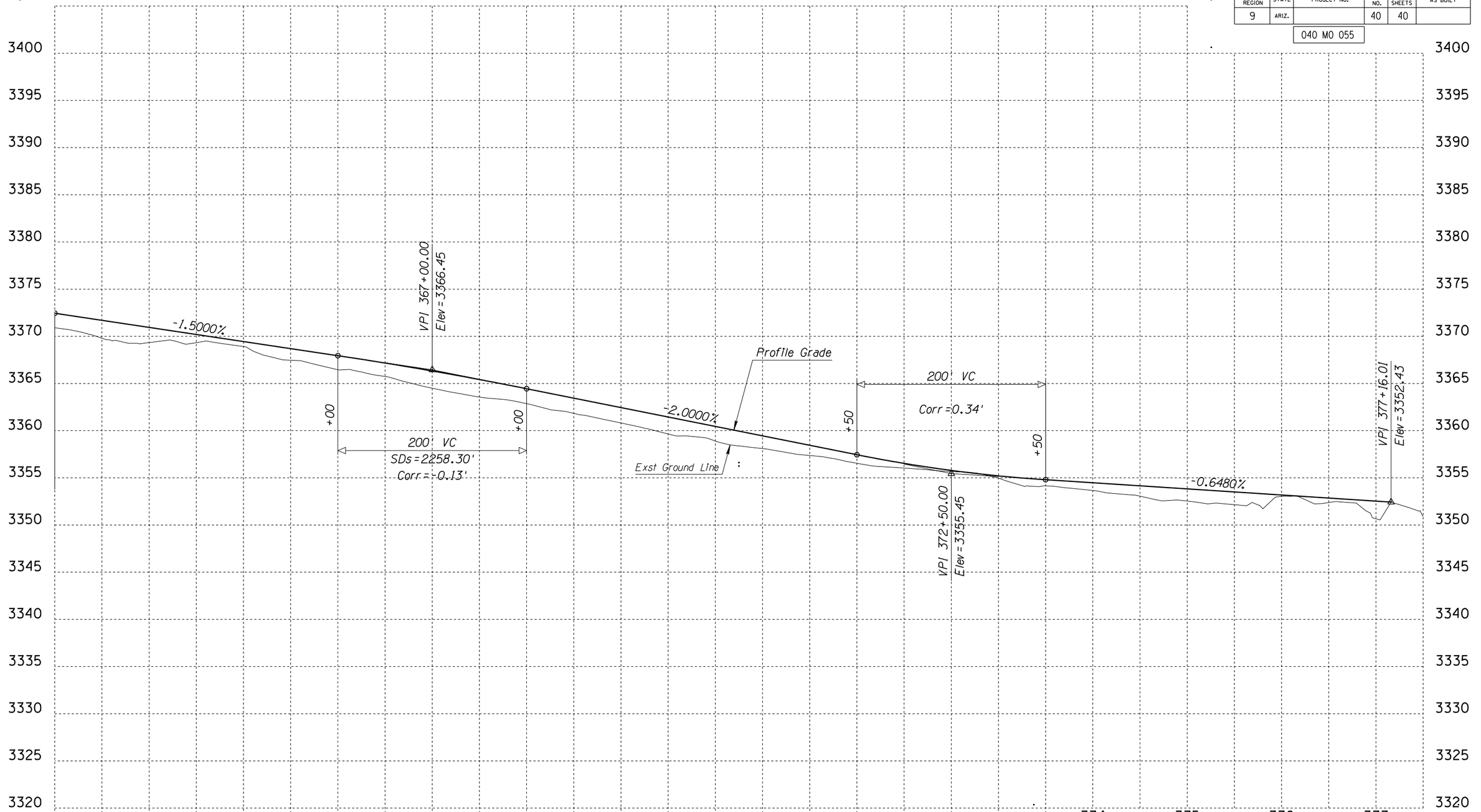
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		40	40	

040 M0 055



	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PHASE 1 - MOHAVE DR - PROFILE
STA 363+00 to 377+50

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN
TRACS NO. H6814 0IL

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
40 OF 40

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE- | SURVEY NO.

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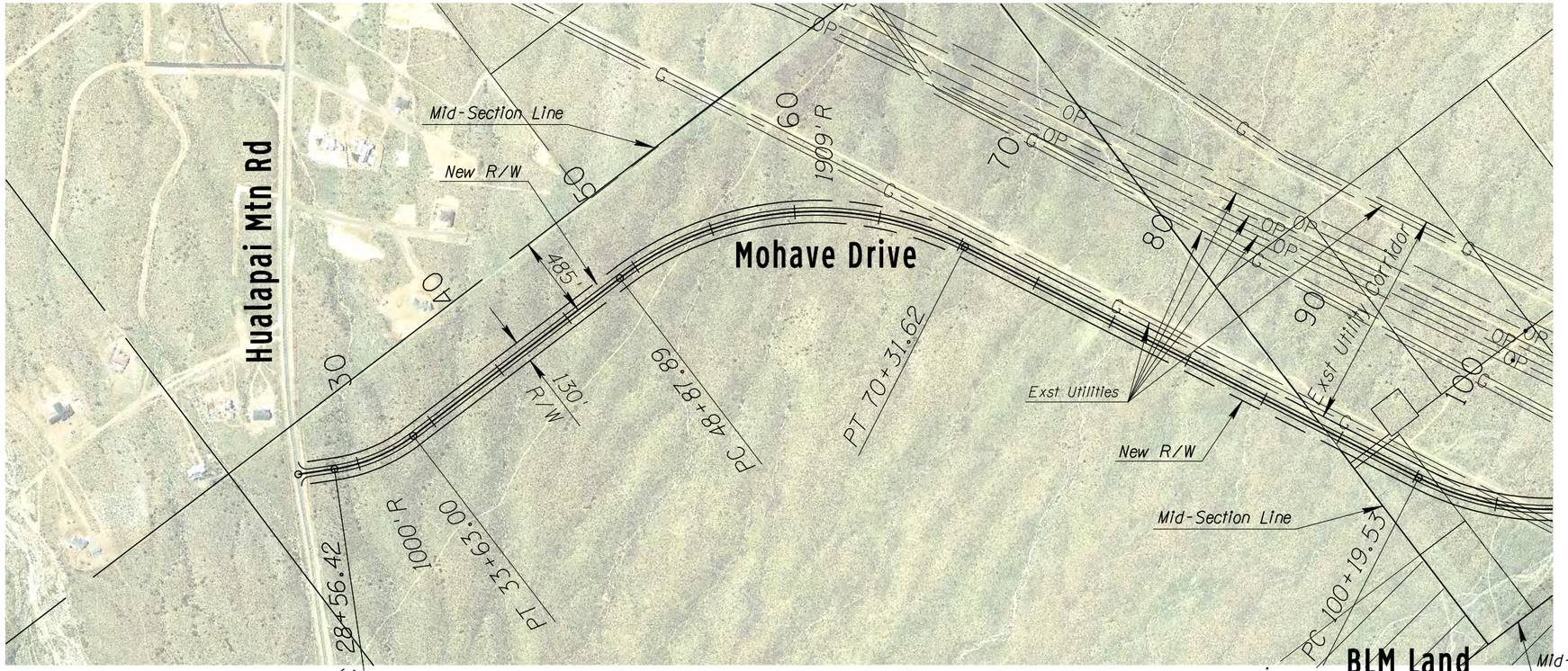
APPENDIX B

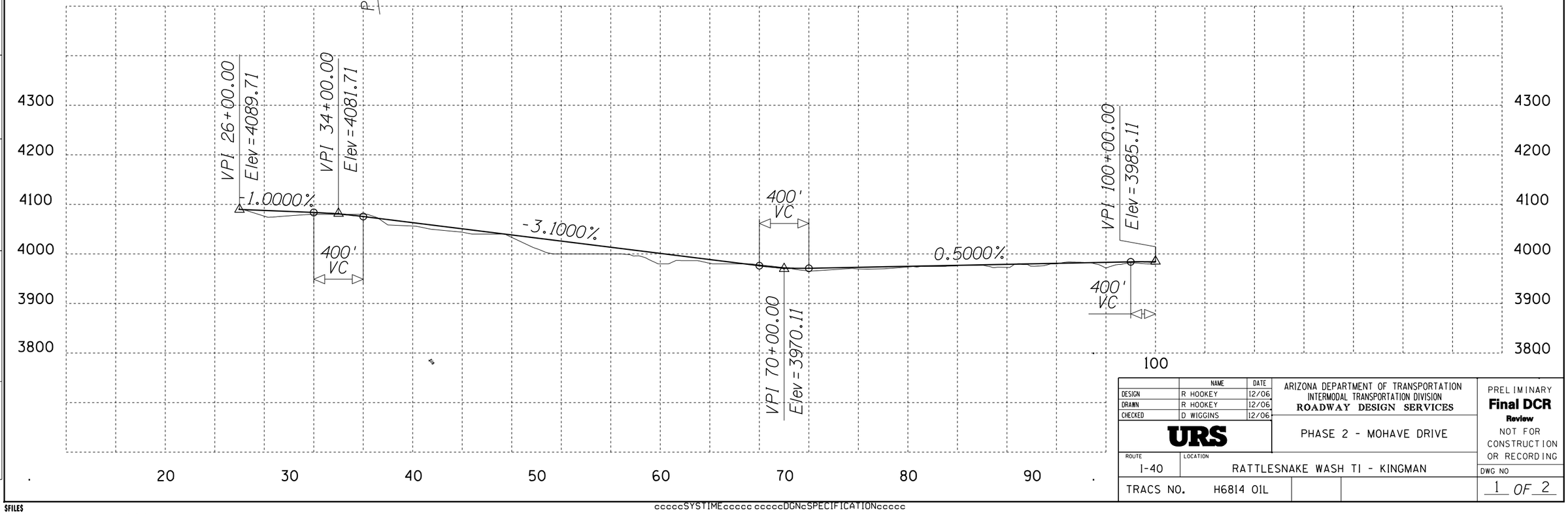
TYPICAL SECTIONS AND PLAN AND PROFILE SHEETS FOR PHASE 2 RECOMMENDED ALTERNATIVES

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.			40	

040 M0 055

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-





	NAME	DATE
DESIGN	R HOOKEY	12/06
DRAWN	R HOOKEY	12/06
CHECKED	D WIGGINS	12/06

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 2 - MOHAVE DRIVE

ROUTE: I-40

LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

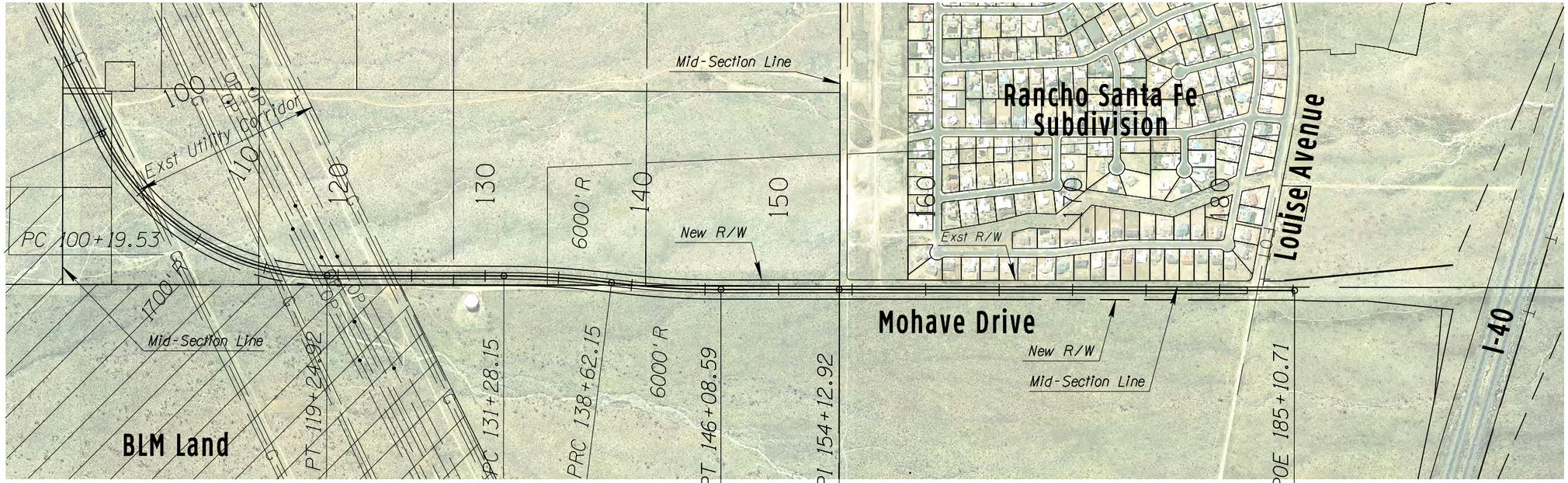
PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

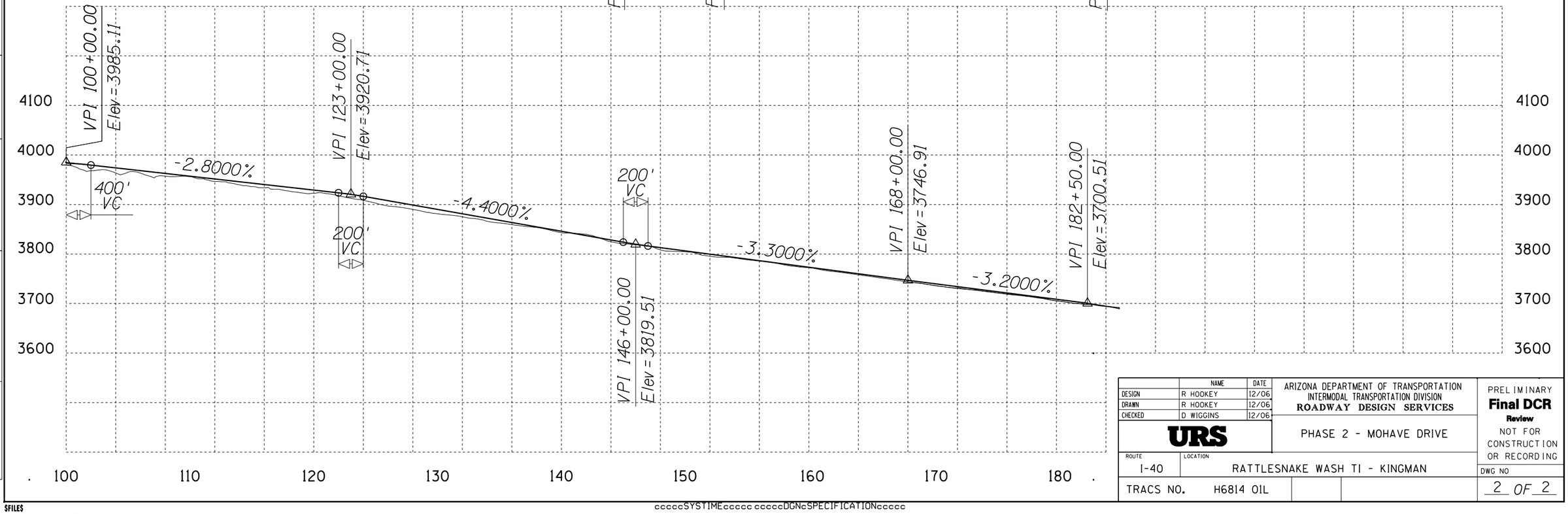
DWG NO 1 OF 2

$FILE$ $USER$ $DATE$ $TIME$

ccccc$SYSTIME$ccccc cccccDGNc$SPECIFICATION$ccccc

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.			40	
		040 M0 055			





	NAME	DATE
DESIGN	R HOOKEY	12/06
DRAWN	R HOOKEY	12/06
CHECKED	D WIGGINS	12/06

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

PHASE 2 - MOHAVE DRIVE

ROUTE: I-40
LOCATION: RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO
2 OF 2

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

$FILE$
$USER$ $DATE$ $TIME$

ccccc$SYSTIME$ccccc cccccDGNcSPECIFICATIONcccccc

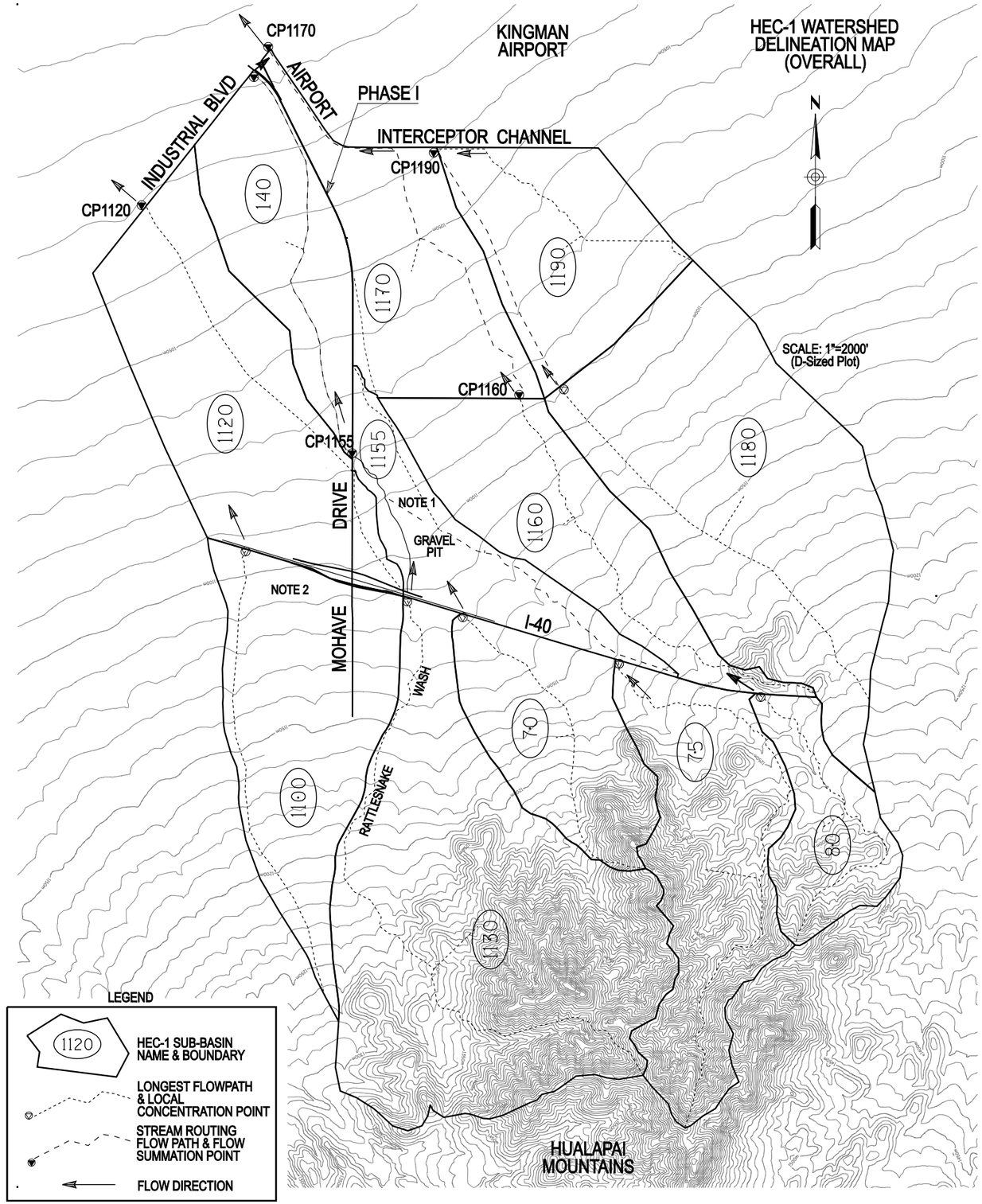
APPENDIX C

WATERSHED DELINEATION MAPS

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.		1	1	
		040 M0 055			

HEC-1 WATERSHED DELINEATION MAP (OVERALL)

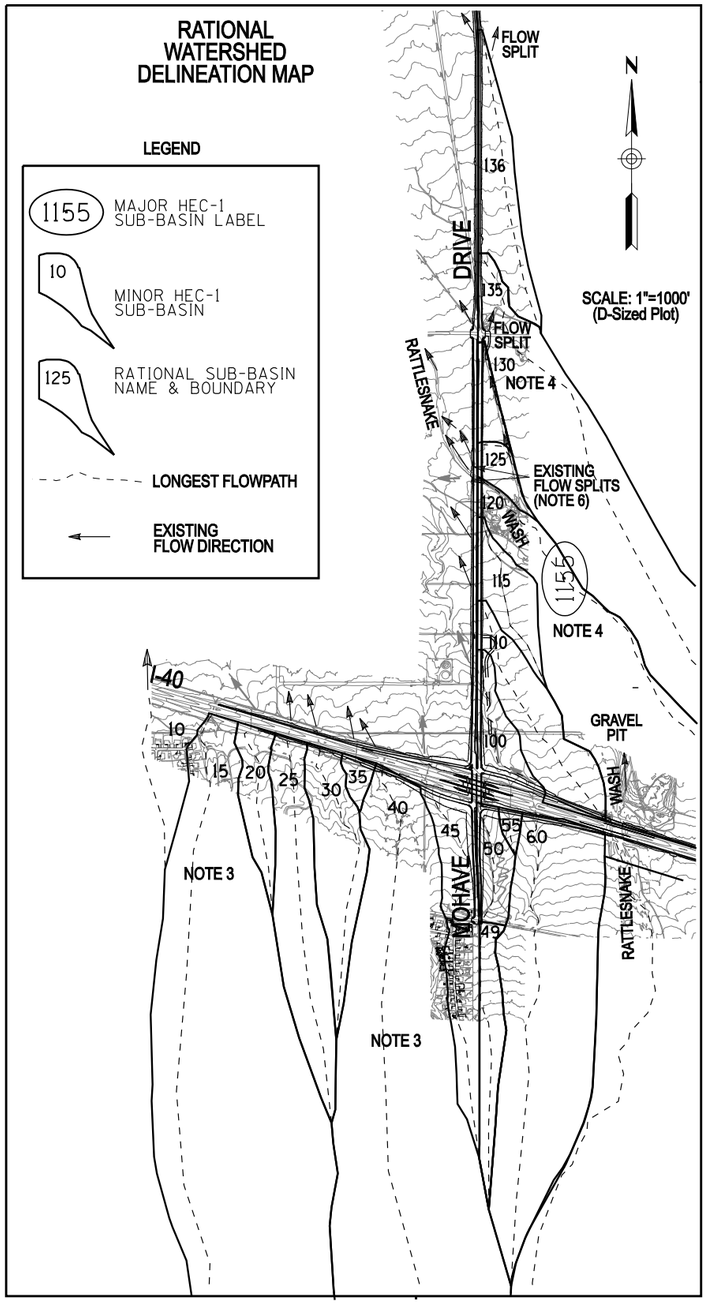
KINGMAN AIRPORT



LEGEND

- 1120 — HEC-1 SUB-BASIN NAME & BOUNDARY
- LONGEST FLOWPATH & LOCAL CONCENTRATION POINT
- STREAM ROUTING FLOW PATH & FLOW SUMMATION POINT
- FLOW DIRECTION

RATIONAL WATERSHED DELINEATION MAP



NOTES:

1) ROUTED FLOWS FROM RATTLESNAKE WASH AND TRIBUTARIES SB70 AND SB75 ARE ASSUMED TO JOIN IN THE GRAVEL PIT.

2) RATIONAL SUB-BASINS ARE NOT SHOWN FOR CLARITY. SEE INSET.

3) MINOR HEC-1 SUB-BASINS 15 AND 40 ARE PART OF HEC-1 SUB-BASIN 1100.

4) MINOR HEC-1 SUB-BASIN 120 AND 135 ARE PART OF MAJOR HEC-1 SUB-BASIN 1155.

5) HEC-1 WATERSHED MAP SHOWS CONTOURS IN 10 METER INCREMENTS. RATIONAL MAP SHOWS CONTOURS IN 5 FOOT INCREMENTS.

6) EXISTING FLOW SPLITS ON RATTLESNAKE WASH WERE NOT MODELED BECAUSE MOHAVE DRIVE WILL REDIRECT ALL FLOW INTO NEW CHANNEL.

FIGURE A1-1

	NAME	DATE
DESIGN	D STOUGH	3/07
DRAWN	D STOUGH	3/07
CHECKED		3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

WATERSHED DELINEATION MAPS
HEC-1 & RATIONAL SUB-BASINS

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	1 OF 1
TRACS NO. H6814 01L		

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

P:\ADOT\23444699-I40RattlesnakeWashTI\CADD\Drainage\FIG A1-1_DRAINAGE AREAS.dgn
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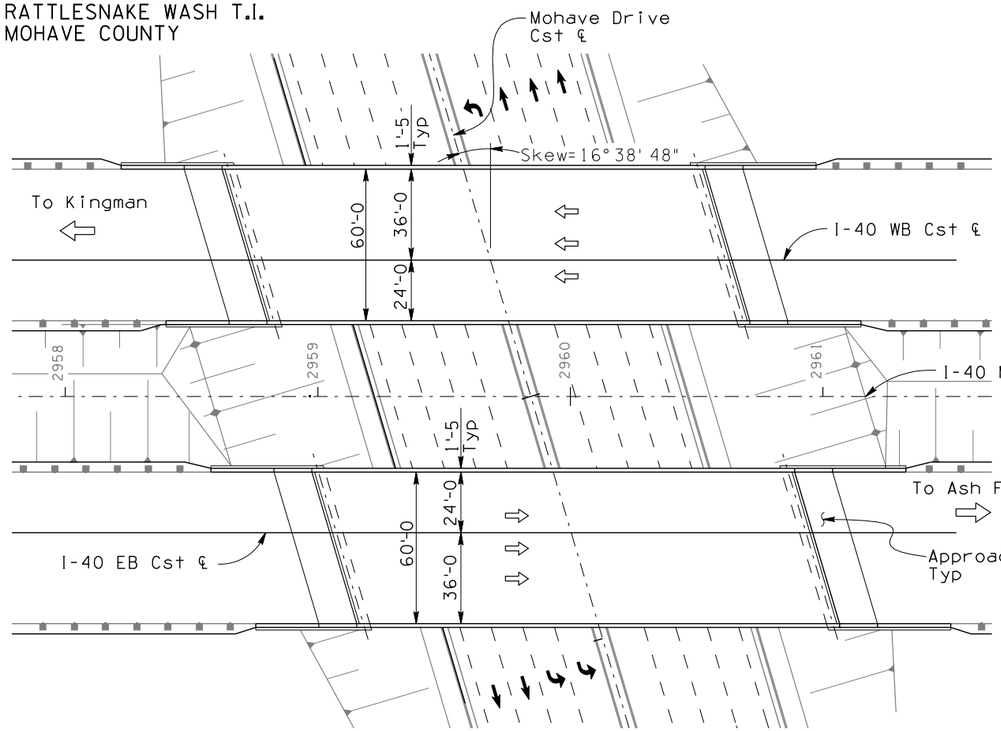
APPENDIX D

STRUCTURE GENERAL PLAN AND ELEVATION

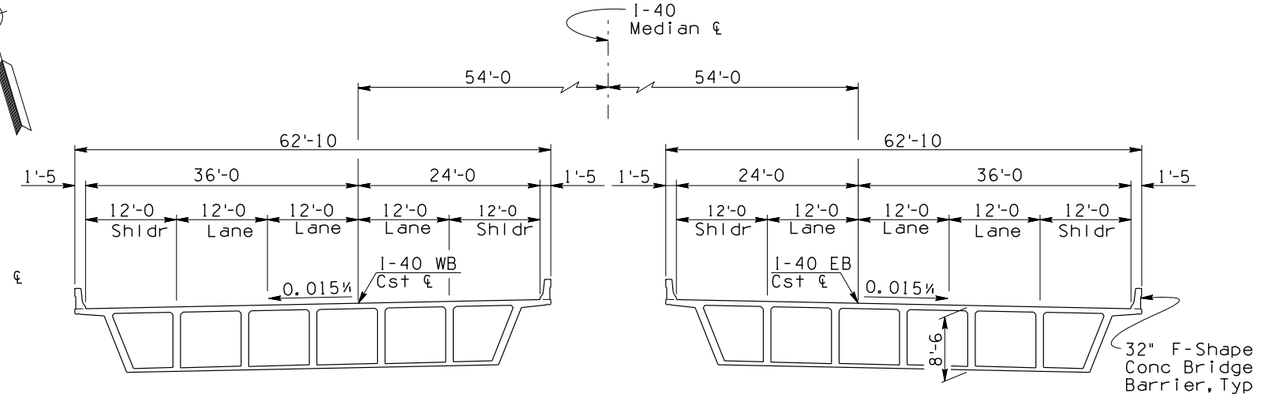
KINGMAN - WILLIAMS HIGHWAY (I-40)
RATTLESNAKE WASH T.I.
MOHAVE COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			

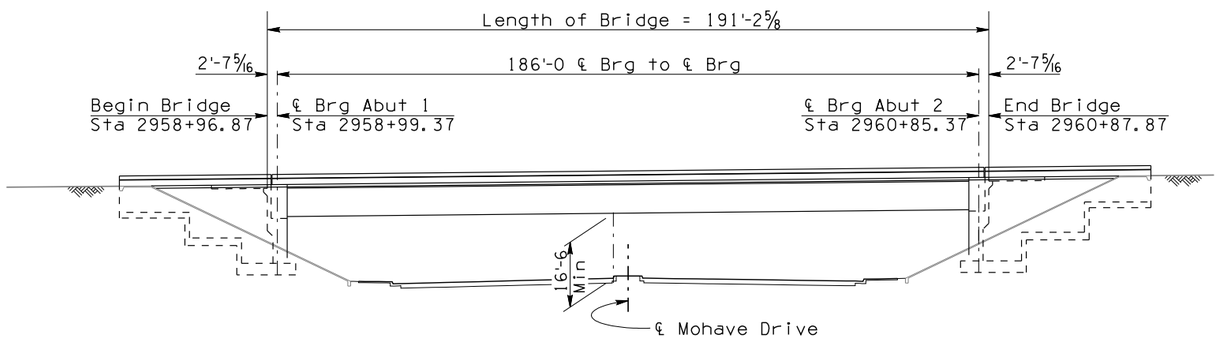
040 MO 57



LOCATION PLAN
2 - New Single Span Cast-in-Place Post-Tensioned
Box Girder Bridges
Skew Angle = 16°38'48" Lt
Scale: 1"=60'-0



TYPICAL SECTION
Scale: 1"=20'-0



ELEVATION
Scale: 1"=40'-0

	NAME	DATE
DESIGN	KGR	03/07
DRAWN	TJC & AG	03/07
CHECKED	RAS	03/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 2958+
MOHAVE DRIVE T.I. OVERPASS
GENERAL PLAN & ELEVATION

RATTLESNAKE WASH TI - KINGMAN

ROUTE	MILEPOST	STRUCTURE NO.
I-40	xx.xx	XXXX

TRACS NO. H6814 01L | - |

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. S-2.01

1 OF 1

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.

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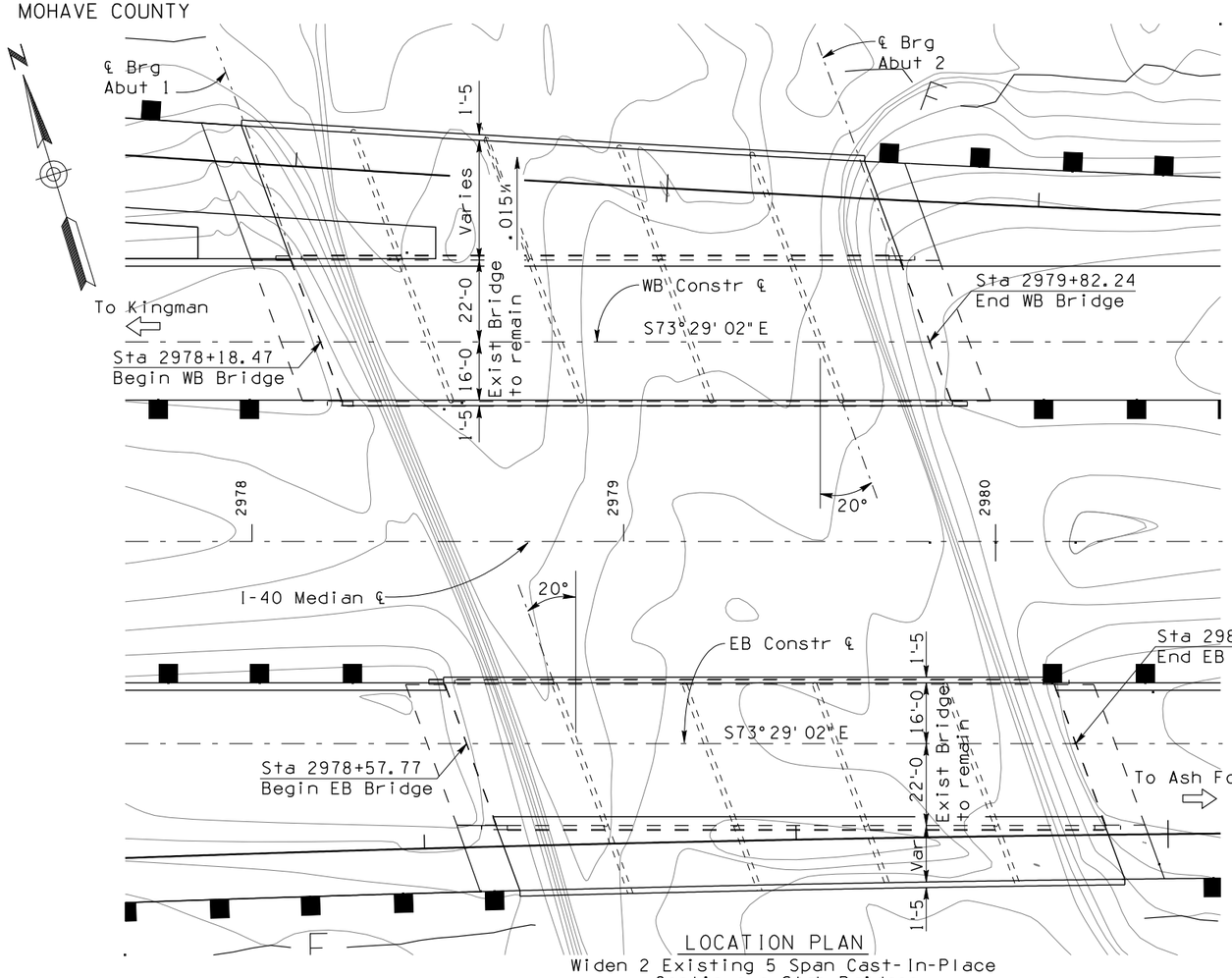
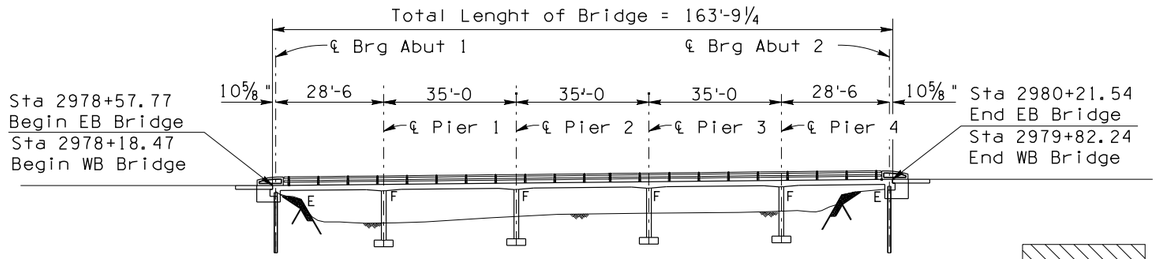
KINGMAN - WILLIAMS HIGHWAY (I-40)
RATTLESNAKE WASH T.I.
MOHAVE COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			

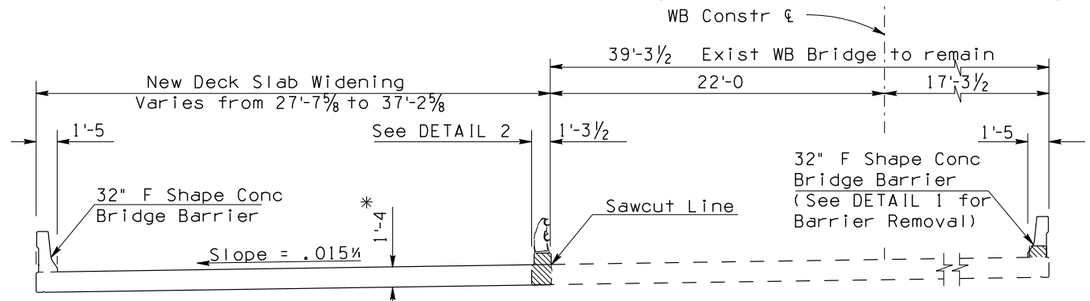
040 M0 57



LOCATION PLAN
Widen 2 Existing 5 Span Cast-In-Place
Continuous Slab Bridges
Skew 20° Left
Scale: 1" = 40'-0

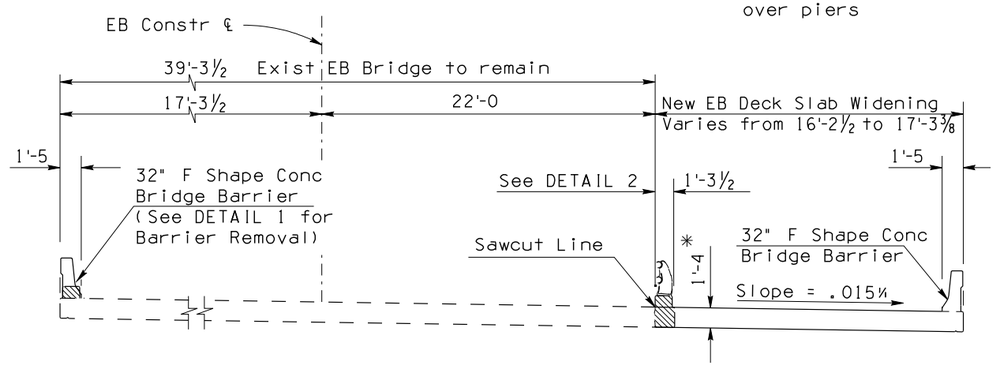


LONGITUDINAL SECTION
Bridge Length and Stations are
Measured along EB & WB Construction ℄'s
Scale: 1" = 40'-0

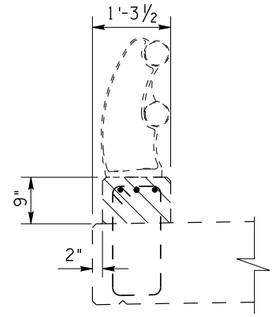


TYPICAL DECK SECTION WB
Scale: 1"=10'-0

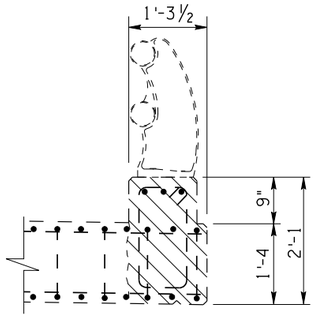
* Varies to 1-8 over piers



TYPICAL DECK SECTION EB
Scale: 1"=10'-0



DETAIL 1
Median Side Removal
Not to Scale



DETAIL 2
Outside Widening Removal
Not to Scale

Indicates concrete removal

	NAME	DATE
DESIGN	KGR	03/07
DRAWN	TJC & AG	03/07
CHECKED	RAS	03/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 2979+
RATTLESNAKE WASH BRIDGE
GENERAL PLAN

ROUTE	MILEPOST	STRUCTURE NO.
I-40	xx.xx	XXXX

RATTLESNAKE WASH TI - KINGMAN

TRACS NO. H6814 01L | - |

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. S-3.01

___ OF ___

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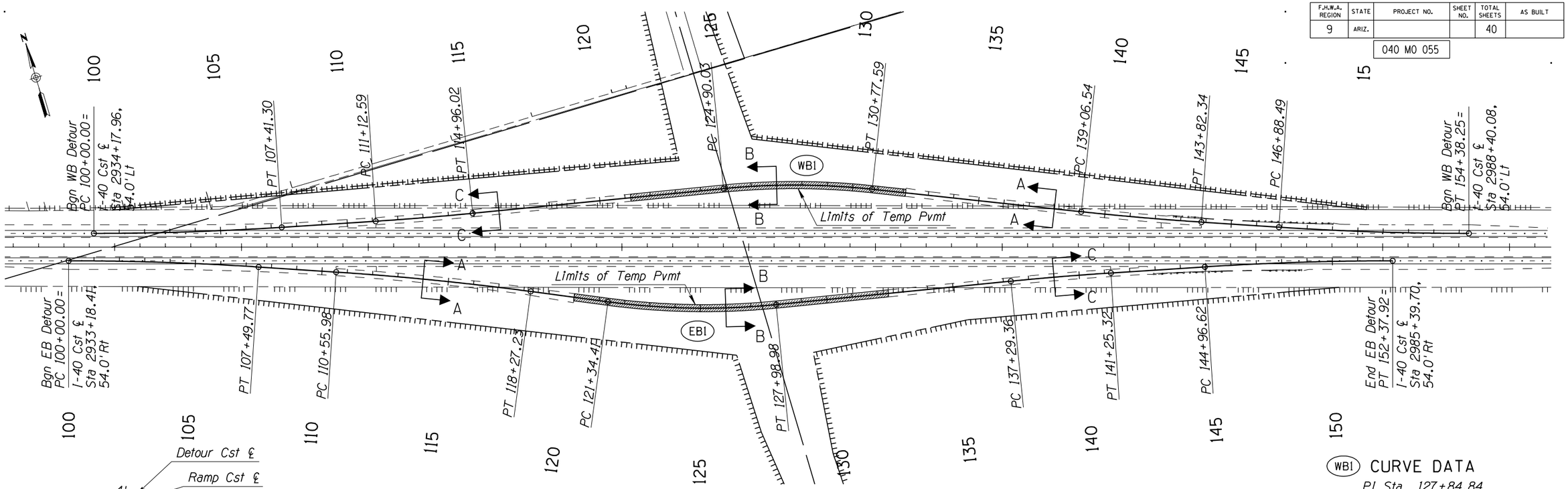
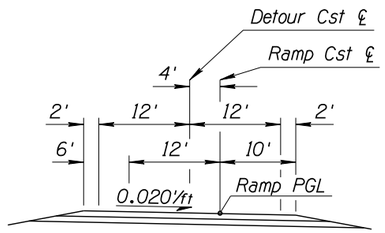
APPENDIX E

PRELIMINARY DETOUR PLANS SHEETS

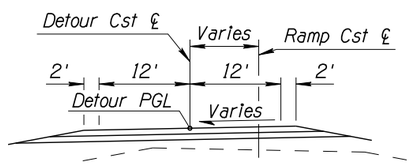
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.			40	

040 M0 055

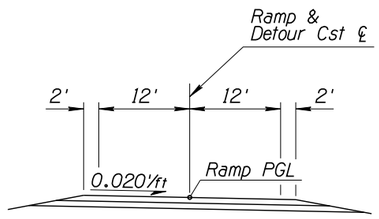




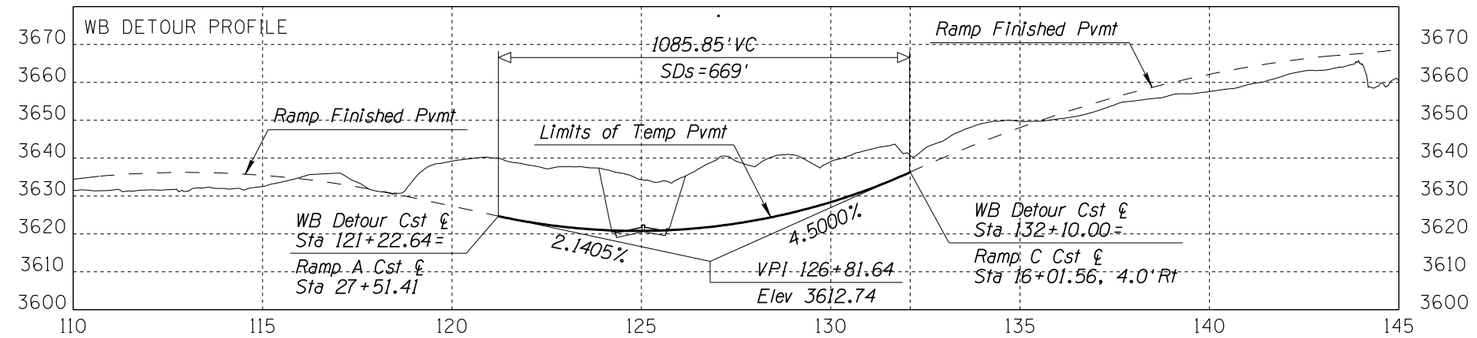
DETOUR SECTION A-A
Looking Direction of Travel

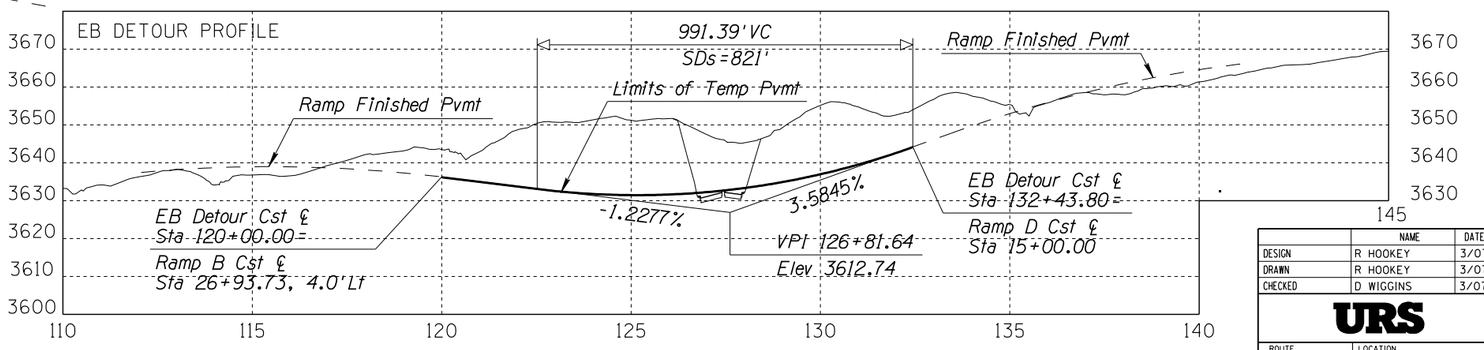


DETOUR SECTION B-B
Looking Direction of Travel



DETOUR SECTION C-C
Looking Direction of Travel





WBI CURVE DATA

PI Sta 127+84.84

Main Curve
Δ=11°45'05"Rt
D=2°00'00"
R=2864.79
L=587.57
T=294.82
Ext=15.13
Super=3.0%

EBI CURVE DATA

PI Sta 124+68.19

Main Curve
Δ=13°17'29"Lt
D=2°00'00"
R=2864.79
L=664.57
T=333.78
Ext=19.38
Super=3.0%

All other curves are
D=0°30'00"
R=11459.16

	NAME	DATE
DESIGN	R HOOKEY	3/07
DRAWN	R HOOKEY	3/07
CHECKED	D WIGGINS	3/07

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-40 WB & EB DETOUR
PLAN & PROFILE

PRELIMINARY
Final DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-40	RATTLESNAKE WASH TI - KINGMAN	
TRACS NO. H6814 01L		1 OF 1

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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APPENDIX F

LETTER OF INTENT BETWEEN ADOT AND CITY OF KINGMAN

Arizona Department of Transportation

Office of the Director

206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

January 30, 2006

The Honorable Monica Gates
Mayor
310 N. 4th Street
Kingman, AZ. 86401

Re: LETTER OF INTENT
ECS File No.: JPA 05-032
TRACS: 01L
Project No.:
Section: I-40/ Rattlesnake Interchange

Dear Mayor Gates:

The purpose of this letter is to outline the intent of the Arizona Department of Transportation (ADOT) and the City of Kingman (City) regarding the above referenced project; which includes two phases.

Phase I:
Consists of a new full access traffic interchange (TI) with an overpass structure over Interstate 40 (I-40) at the Rattlesnake Wash location. At this time, it is envisioned that the overpass structure will include 5 lanes of traffic including connections to Louise Avenue on the south, Airway Avenue and further north to Kingman Airport Industrial Area. The Design Concept Report will identify and outline the specific design elements.

ADOT and the City propose to jointly fund the planning, design and construction of Phase I, referenced as Phase I or the Proposed Project, and is currently estimated to cost $17,000,000.00. The cost will be revised as the Proposed Project moves through the scoping and design process. ADOT and the City agree that it is in the best interest of the public to share in the construction cost for Phase I at a 70% State, 30% City split.

On June 17, 2005, the State Transportation Board programmed $500,000.00 in fiscal year (FY) 2006 to complete the scoping document for Phase I of the Proposed Project, which consists of a Design Concept Report and Environmental Document (DCR/EnvDoc) for the Proposed Project.

Upon completion of the DCR/EnvDoc, ADOT intends to request approval of the State Transportation Board to program funds for the design of the Proposed Project in FY 2008 contingent on availability of funds and upon approval of the State Transportation Board. Design funds are anticipated to be 10% of the estimated construction costs upon completion of the scoping document.

ADOT is of the understanding, that during both the scoping and design phase of the Proposed Project, the City will pursue the acquisition of all necessary rights of way for the Proposed Project, with the intention of completing it by June 30, 2008.

Once the design and acquisition of all anticipated rights of way have been completed and obtained, ADOT and the City intend to program the construction funding, as defined in and based upon the design concept report (DCR) of the Proposed Project, in FY 2011, contingent on availability of funds and upon approval of the State Transportation Board.

ADOT and the City understand and acknowledge construction costs will be modified based on the State's engineering estimates provided by the scoping documents, when complete.

Construction costs will also be refined and modified throughout the design process with the State and the City sharing costs at a 70% to 30% ratio, respectively.

Design requirements for this Proposed TI and improvements within the State's rights of way, will conform to the State's design standards and guidelines.

Design requirements for all other improvements, outside the State's rights of way will conform to local design standards and guidelines.

Construction requirements for this Proposed TI and improvements within the State rights of way will conform to the State's standard specifications and details for highway construction.

Construction requirements for all other improvements, outside the State's rights of way will conform to local standards, specifications and details for roadway construction.

Phase II:
Consists of connecting Louise Avenue to Hualapai Mountain Road. It is our understanding that Phase II is the sole responsibility of the City and that the City intends to complete the planning process and acquire all necessary rights of way for Phase II by December 31, 2011. In addition, the City also intends to complete the design and construction of Phase II, by July 1, 2015.

To indicate the City's concurrence of the mutual intentions of both the City and the State, please sign below in the space provided and return one original of this instrument to the undersigned, at the above address, to the attention of Mail Drop 100A.

Sincerely,

Victor M. Mendez
Director

Concurrence by the City

Monica Gates
Mayor

Date: 02-15-06

ATTEST:
ACTING City CLERK

CITY OF KINGMAN INCORPORATED 1952

Conform Copy

RESOLUTION NO. 4249

A RESOLUTION BY THE MAYOR AND COMMON COUNCIL OF THE CITY OF KINGMAN, ARIZONA, AUTHORIZING THE MAYOR TO SIGN A LETTER OF INTENT WITH ADOT FOR THE CONSTRUCTION OF THE RATTLESNAKE WASH/I-40 TRAFFIC INTERCHANGE

WHEREAS, as the community continues to grow and traffic volumes continue to increase, the City Council recognizes the need for the development of infrastructure to provide access to growing areas of the City and for the development of new areas for commerce and industry; and

WHEREAS, Council has identified the need for a new traffic interchange to be located in the vicinity of Rattlesnake wash and Interstate 40 to facilitate access to Interstate 40 and traffic movement between the Kingman Airport and Hualapai Mountain Road; and

WHEREAS, the Arizona Department Of Transportation (ADOT) is willing to share, with the City, in the cost of designing and constructing the interchange;

NOW, THEREFORE BE IT RESOLVED, that the Mayor is authorized to sign the attached letter of intent between the City of Kingman and ADOT for the design and construction of the Rattlesnake Wash/I-40 Traffic Interchange.

PASSED AND ADOPTED by the Mayor and Common Council of the City of Kingman, Arizona, on February 6, 2006.

APPROVED:

ATTEST:

Tom Weddle, City Clerk

Monica Gates, Mayor

APPROVED AS TO FORM:

Robert A. Taylor, City Attorney

CITY OF KINGMAN INCORPORATED 1952 ARIZONA

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FEE # 2006015363
DATE 2-13-06
BOOK 4106
PAGES 49-51

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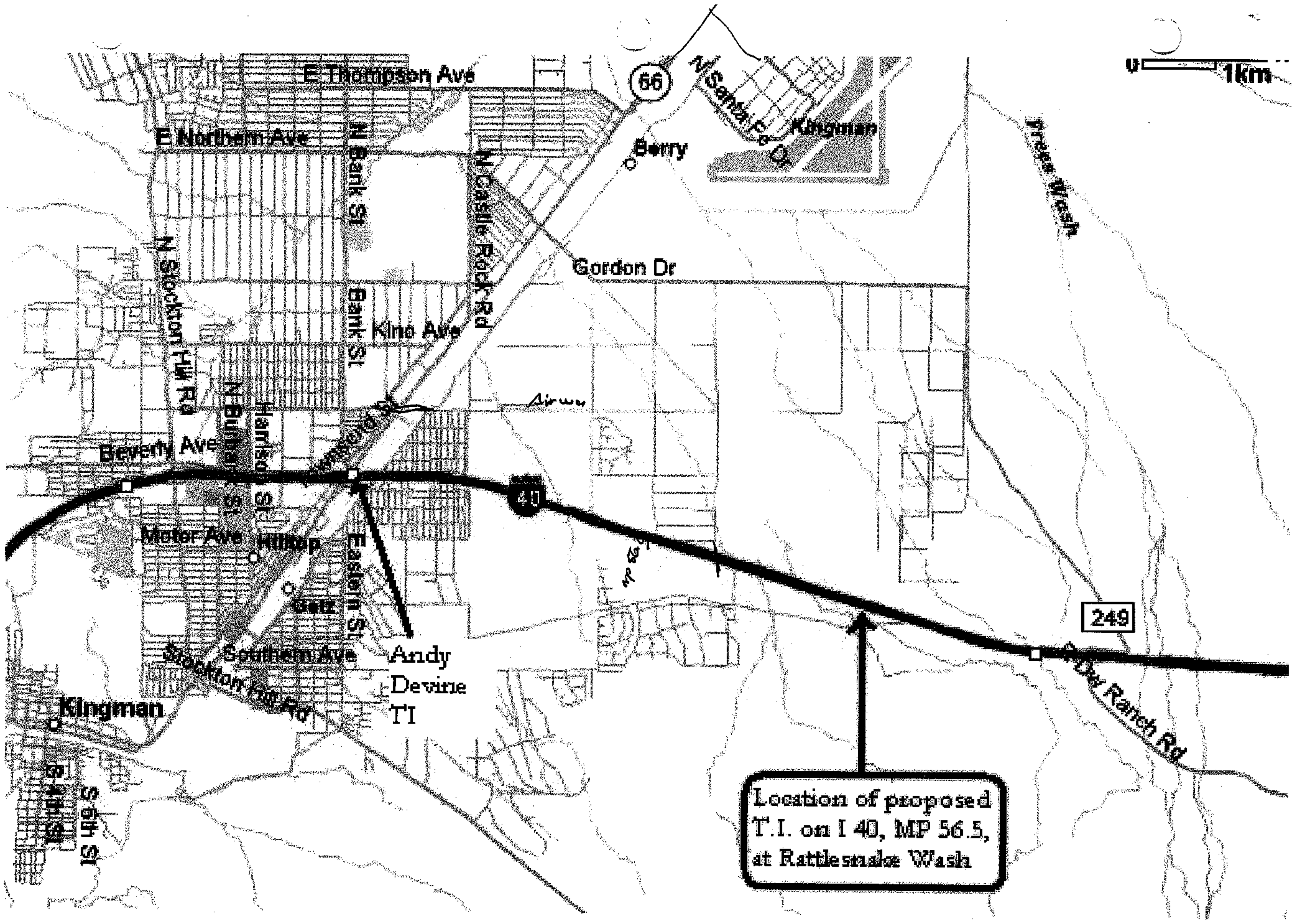

1km
66
E Thompson Ave
E Northern Ave
N Santa Fe Dr
Kingman
Berry
N Bank St
N Castle Rock Rd
Gordon Dr
Press Wash
Bank St
Kino Ave
N Stockton Hill Rd
N Burbank St
Harrison St
Beverly Ave
40
Meter Ave
Hilltop
Eastern St
Getz
Southern Ave
Stockton Hill Rd
Andy
Devine
TI
Kingman
S 4th St
S 6th St
249
Ranch Rd
Location of proposed
T.I. on I 40, MP 56.5,
at Rattlesnake Wash

APPENDIX G

FEDERAL AVIATION ADMINISTRATION KINGMAN AIRPORT AIRSPACE DETERMINATION LETTER

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Los Angeles Airports District Office

P.O. Box 92007
Los Angeles, CA 90009

May 31, 2007

FILE COPY
Project No. 23444699
File No. 5.3.7

Ms. Brenda Chastain
Airport Manager
Kingman Airport
7000 Flightline Drive
Kingman, AZ 86401

Dear Ms. Chastain:

Kingman Airport, Kingman Arizona
Proposed Roadway (I-40 Rattlesnake Wash Traffic Interchange)
Airspace Case No. 2007-AWP-0178-NRA

The Federal Aviation Administration (FAA) has completed an airspace study from an airspace utilization standpoint of the subject project based upon the proposal submitted by the consultant (URS) representing Arizona Department of Transportation (ADOT) and the city of Kingman. URS also submitted supplemental transmittals to the FAA dated March 8, 2007, April 3, 2007, and April 12, 2007. Our review evaluated the closest point of the proposed roadway to the movement area, which is located approximately 5125 feet south of Runway 3 threshold on extended centerline to the northerly edge of the proposed 130-foot wide road Right-Of-Way (ROW).

Based upon the information submitted, the following conditions must be met:

a. The maximum site elevation of the subject project is 3430 feet Above Mean Sea Level (AMSL). The maximum height for the subject project's concrete median will not exceed 17 feet above the site elevation (above ground level) and 3447 feet AMSL.

b. All construction activities shall be coordinated with the airport manager to ensure that the appropriate Notice to Airmen (NOTAM) is issued.

c. Construction vehicles, equipment and barricades shall be marked and lighted as in accordance with FAA AC 150/5370-2E, *Operational Safety of Airports During Construction* and FAA AC 150/5210-5B, *Painting, Marking and Lighting of Vehicles Used on an Airport*.

d. The Airport Layout Plan and the Exhibit A Airport Property Map must be updated to reflect the subject development and submitted to our office for approval prior to the use of federal funds and commencement of construction.

e. Submit a request to the FAA to release the airport property for the road ROW from aeronautical use to non-aeronautical use. The proposed release would include an:

1) Avigation easement prohibiting non-compatible uses.

2) Appraisal noting how the Fair Market Value was determined noting the estimated amount of the net proceeds (less appraisal and survey fees, escrow expenditures, etc.).

3) Investment plan identifying which projects listed in Kingman Airport five year Airport Capital Improvement Plan would be assigned the net proceeds.

f. This determination does not address the effect of the road ROW on the safe and efficient use of navigable airspace by aircraft on property located off the airport and therefore is not an approval of the proposed road project. Please coordinate with the FAA Air Traffic Organization, AAL-520, Mr. Robert Van-Haastert, at (907) 271-5863 to determine the additional locations requiring evaluation.

If all of the aforementioned conditions (a-f) are met, the FAA has no objection to the proposal.

This determination concerns the effect of the roadway on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

The study did not include any environmental review to determine whether the proposed roadway is environmentally acceptable. This determination does not indicate FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of airspace by aircraft and safety of persons and property on the ground.

Temporary construction equipment used with the proposal that has a greater height than the height of the proposal; which could exceed the notice requirements of Federal Aviation Regulation Part 77, will require separate notice to the FAA on Form 7460-1.

This determination expires on **December 31, 2008**, unless it is otherwise extended, revised, or terminated. An extension, if necessary, may be requested through our office up to 15 days prior this expiration date.

If you have any questions, please contact me at (310) 725-3771.

Sincerely,

**Original Signed By
George W. Buley**

George W. Buley
Program Manager

cc: Honorable Mayor Lester Byram, City of Kingman
Mr. Victor Yang, P.E. Project Manager, ADOT
Mr. Dale Wiggins, P.E., URS Corp
Mr. Robert Van-Haastert, AAL-520
Mr. George Reese, WFPO
Ms. Kimchi Hoang, LAX-600.11

APPENDIX H

FEDERAL HIGHWAY ADMINISTRATION CHANGE OF ACCESS REPORT
DETERMINATION OF ENGINEERING AND OPERATIONAL ACCEPTABILITY LETTERS

Mick

U.S. Department of Transportation
Federal Highway Administration

ARIZONA DIVISION

July 20, 2007

400 East Van Buren Street,
Suite 410
Phoenix, Arizona 85004-0674
602-379-3646

In Reply Refer To:
HOP-AZ

Determination of Acceptability
STP-040-B(ASL)
040 MO 057 H6810 01L
I-40, Rattlesnake Wash Traffic Interchange

Ms. Mary Viparina, P.E.
Assistant State Engineer
ADOT Intermodal Transportation Division
Roadway Engineering Group
206 South 17th Avenue
Phoenix, Arizona 85007-3213

Dear Ms. Viparina:

We have received the request from the Arizona Department of Transportation (ADOT) for the Change of Access (COA) for the Interstate 40 Rattlesnake Wash Traffic Interchange (TI), dated June 12, 2007. We understand this project will construct a new TI connecting onto Mohave Drive approximately 3 miles east of the Andy Devine Blvd/SR66 TI. While Rattlesnake Wash is an identifiable geographic landmark, the new TI will be named Mohave Drive TI (unless the connecting cross street name is changed before construction).

As you know, the Federal Highway Administration (FHWA's) responsibility is to ensure the continued safety and operational viability of the Interstate, and all COA requests will be reviewed with these requirements in mind.

The following are points identified in the COA submittal that warrant discussion.

- The COA engineering analysis revealed that I-40 will continue to operate at an acceptable Level of Service (LOS) C or better for the near future, but it is expected that the LOS will degrade below C before the design year of 2030.

- As part of the development of this project, ADOT has coordinated with local jurisdictions to ensure that proper long range planning has been accomplished. FHWA acknowledges that the Kingman Area Transportation Study (KATS) addresses local roadway infrastructure improvements. However, the traffic volume data shows that even with the local roadway system improvements, the Interstate will experience large volumes of short distance travel within Kingman city limits.

- There is also the possibility that an additional TI (Kingman Crossing) will be constructed in between Rattlesnake TI and Andy Devine TI, creating three TIs within a 3 mile Interstate segment. This circumstance makes auxiliary lanes highly desirable to counteract merging, diverging and weaving interference between adjacent interchanges.

- It was noted that the MoveAZ 20 year long range transportation plan calls for I-40 to be widened to a 3 lane highway in both directions. Experience shows that within rapidly developing areas, with the 2030 design year

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expected volumes, an auxiliary lane will be required; essentially making the segments of I-40 between the three TIs a 4 lane roadway (3 through lanes with an auxiliary lane) in each direction.

Based on the items stated above, the FHWA's expectation is that an auxiliary lane be included as part of the Rattlesnake TI and Kingman Crossing TI projects. Since it is unknown which TI will be constructed first, the option of constructing an elongated auxiliary lane on Rattlesnake TI is acceptable. An elongated auxiliary lane will construct added length to Rattlesnake TIs parallel on/off ramps allowing seamless connection during construction to the on/off ramps of Kingman Crossing TI; effectively laying the groundwork for auxiliary lanes between the Rattlesnake TI and the Kingman Crossing TI. The Kingman crossing TI would then provide for the auxiliary lanes between it and the existing Andy Devine TI.

Under a scenario where Kingman Crossing TI is not constructed, FHWA finds that it would not be prudent to construct a three mile auxiliary lane from Rattlesnake TI to Andy Devine TI. Under this circumstance, FHWA finds the submitted COA request for Rattlesnake TI to be acceptable with properly designed parallel on/off ramps.

In closing, the FHWA has reviewed the report for the change of access, and finds that given the conditions mentioned above, the request is acceptable from an engineering and operational standpoint. After the project is cleared environmentally, ADOT may then request formal approval of the change of access from the FHWA.

Sincerely,

KENNETH H. DAVIS

Robert E. Hollis
Division Administrator

cc:
Sam Elters 102A
Mike Kondelis K630
KDavis
ASLirange:cdm

Arizona Department of Transportation
Intermodal Transportation Division
206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

Janet Napolitano
Governor

Victor M. Mendez
Director

Sam Elters
State Engineer

October 1, 2007

Robert E. Hollis
Division Administrator
Federal Highway Administration
ATTN: Aryan Lirange
One Arizona Center, Suite 410
400 East Van Buren Street
Phoenix, AZ 85004-2285

Subject: Change of Access Report
Project: 040 MO 57 H6814 01L / STP-040-B(ASL)
I-40 Rattlesnake Wash Traffic Interchange (TI)

Dear Mr. Hollis:

This letter is intended to summarize the agreement between Arizona Department of Transportation (ADOT) and Federal Highway Administration (FHWA) on the Change of Access (COA) request for Rattlesnake TI. We have received your Determination of Engineering and Operational Acceptability (DEOA) letter dated July 20, 2007 regarding the aforementioned COA request. The letter finds that the COA request is acceptable from an engineering and operational standpoint. The letter also listed several points that were identified in the COA Report that warranted discussion:

- The COA engineering analysis revealed that I-40 will continue to operate at an acceptable Level of Service (LOS) C or better for the near future, but it is expected that the LOS will degrade below C before the design year of 2030.
- As part of the development of this project, ADOT has coordinated with local jurisdictions to ensure that proper long range planning has been accomplished. FHWA acknowledges that the Kingman Area Transportation Study (KATS) addresses local roadway infrastructure improvements. However, the traffic volume data shows that even with the local roadway system improvements, the Interstate will experience large volumes of short distance travel within the Kingman city limits.
- There is also the possibility that an additional TI (Kingman Crossing) will be constructed in between Rattlesnake Wash TI and Andy Devine TI, creating three TIs within a three mile Interstate segment. This circumstance makes auxiliary lanes highly desirable to counteract merge, diverging and weaving interference between adjacent interchanges.
- It was noted that the MoveAZ 20 year long range transportation plan calls for I-40 to be widened to a 3 lane highway in both directions. Experience shows that within rapidly developing areas, with the 2030 design year expected volumes, an auxiliary lane will be required; essentially making the segments of I-40 between the three TIs a four lane roadway (3 through lanes with an auxiliary lane) in each direction.

Based on the above points identified in the DEOA letter, and subsequent discussions with FWHA, ADOT and FHWA have agreed to the following conditions in addition to the recommendations in the COA Report:

- Based on the possibility that an additional traffic interchange (TI), Kingman Crossing TI, may be constructed between the Rattlesnake Wash TI and the Andy Devine TI, creating three TIs within a three mile interstate segment, auxiliary lanes are required to maintain an acceptable Level of Service C or better for the design year of 2030 and to counteract merge, diverging and weaving interference between the adjacent TIs. Since it is unknown which TI will be constructed first, the Rattlesnake Wash TI will include elongated parallel entrance and exit ramps that will extend west halfway to the termini of the proposed Kingman Crossing east side entrance and exit ramps. This will effectively lay the groundwork for the auxiliary lanes between the Rattlesnake Wash TI and the Kingman Crossing TI. This will allow for a seamless connection during construction of the Kingman Crossing east side ramps, which will extend the auxiliary lanes to connect to the Rattlesnake Wash TI elongated parallel entrance and exit ramps.
- Under the scenario where the Kingman Crossing TI will not be constructed, the Rattlesnake Wash TI west side entrance and exit ramps will be constructed as standard parallel type ramps.
- The MoveAZ 20-year long-range transportation plan calls for I-40 to be widened to three lanes in each direction. When scoping is conducted to widen I-40 to three lanes, ADOT will evaluate the need for auxiliary lanes between the East Kingman TI and the Kingman Crossing TI.

Sincerely,

Mary Viparina

Mary Viparina, P.E.
Assistant State Engineer
Roadway Engineering Group

Cc: Project Manager, George Wallace
Kingman District Engineer, Mike Kondelis
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